CHAPTER 1

PROBLEM AND ITS BACKGROUND

1.1 Introduction.

Education has long been considered as a tool for societal development. Every society has its own developmental needs and levels of aspiration, which it hopes to achieve through education. Accordingly, the aims and objectives of education are laid down. These aims and objectives change with the changing needs and challenges of the society. With the continuous increase in the scientific knowledge leading to industrialization and urbanization, the aim of spreading scientific knowledge among the masses and training people in scientific methods occupied a prominent position in the lists of aims of education laid down by almost every society. Regarding the need of science education, a few lines from a UNESCO document ‘Learning To Be’ are worth quoting:

“The content of man’s universe has changed. Whether he likes it or not, the individual is precipitated into a world steeped in science. This applies as much to the Indian peasant caught up in the green revolution, as to the automated factory worker or the technician in a nuclear physics laboratory.

In modern civilization, man can only participate in production if he is capable of understanding a number of scientific methods, rather than applying them. What is more, he can only properly perceive and understand the universe in which he finds himself to the extent that he possesses the keys to the scientific knowledge.” (P147)

And now when we have entered into the twenty first century, laced with highly advanced scientific knowledge and technology, with a strong ambition to explore and conquer the universe, the knowledge of science and development of scientific temper has become an essential requirement.
A thorough understanding of science and scientific methods leads to scientific humanism wherein the people have a command of scientific thought and language, are objective and systematic with a rational outlook and have an ability to make sound decisions.

Science as a subject is mostly misunderstood to be a set of concepts, theories and principles to be learnt by heart. Science is not ‘an agglomeration of bits of learning and intellectual instruments to be fastened on to an individual who otherwise persists in all his traditional attitudes and behaviour’.

Science is the search for knowledge and understanding of nature and explanation of natural phenomenon.

Science is a way of thinking, a way of behaving, an approach road to new knowledge. The knowledge of science should train a person to think in a rational manner, to be responsible and systematic, truthful and honest, sincere and hardworking.

"Science moves forward on the wheels of dogmatism, dynamism and discovery at the same time. Open-mindedness, curiosity, inquiring into the basis of all things, collection of data, demand for verification and proofs, statistical reasoning, suspended judgement, acceptance of warranted conclusions and willingness to change one’s opinion in the light of new evidence are the ferments which characterize the scientific enterprise” N. Vaidya in ‘Science Education’ p 354, Fifth Survey of Educational Research (1988-92), Vol.1, NCERT.
Most of our social and economic problems can be solved easily if we are able to develop scientific minds. "For all the extremely diverse and powerful reasons - ranging from present labour needs and the need to control reality, to the need of self control, scientific method and ethical training - training in science and in the scientific spirit appears as one of the major goals of any contemporary education system" (Learning to be, UNESCO).

1.2 Aims and Objectives of science teaching

Science teaching in India was first introduced in Hindu College in Calcutta, which was founded in 1817 by David Hare under the leadership of Raja Ram Mohan Roy. He felt that 'modern education' could change the outlook of Indians and only then could come the much desired 'social awakening', putting an end to the social evils which were so prevalent in the Indian society at that time.

The aim of starting science education was, therefore, to make scientific knowledge accessible to Indian students and through it develop scientific outlook in them. Since then, science as a subject is available to the students. However, it was not seen as a subject for all students but as one for an elite who would go on to become a scientist, doctor, engineer or an industrialist. Even in free India, science remained an optional subject for almost two decades, though several committees and commissions recommended the need of science education for all.

Secondary Education Commission (1952 – 53) recommended that the aim of education should be 'development of the Scientific Attitude of mind'.

A study team on General Education, 1955 recommended the inclusion of 'Natural Sciences' in the curriculum at undergraduate level.

Indian Parliamentary and Scientific Committee, 1961 recommended for the first time that science education should be compulsory at the High School stage.

The Education Commission (1964 – 66) recommended introduction of science as a subject on a compulsory basis to all pupils as a part of general
education during the first ten years of schooling. It says, "The quality of science teaching has also to be raised considerably so as to achieve its proper objectives and purposes, namely, to promote an ever deepening understanding of basic principles, to develop problem solving, analytical skills and the ability to apply them to the problems of the material environment and social living and to promote the spirit of inquiry and experimentation. Only then can a scientific outlook become part of our way of life and culture."

In the year 1974 – 75, science was introduced as a compulsory subject for all the students up to class X [under the 10+2 scheme of education]. Mass orientation programs for science teachers were organised throughout the country so as to enable them to provide effective science teaching up to secondary level.

Initially, there was a criticism from some students, their parents and even teachers, that every student does not possess an aptitude for science and this compulsion would put up an extra burden on the minds of students. Ishwar Bhai Patel Committee suggested two courses for science education at the secondary level: 'A' and 'B'. Science 'A' course, for the students who intended to pursue science in higher classes and science 'B' for the rest of the students. But this system was not successful and had to be withdrawn soon. Again a uniform curriculum was developed for all the students at secondary level.

National Policy on Education, 1986 and Program of Action 1992 lays stress on quality in science education. It says, "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. Science education programs will be designed to enable the learner to acquire problem solving and decision-making skills and to discover the relationship of science with health, agriculture, industry and other aspects of daily life. Every effort
will be made to extend science education to the vast numbers who have remained outside the pale of formal education.

National Curriculum for Elementary and Secondary Education (NCERT, 1988) also lays stress on the development of scientific temper. "The role of education in refining sensitivities and perceptions that contribute to scientific temper and independence of mind has been well recognized. The curriculum should develop in the pupil well-defined abilities and values such as the spirit of inquiry, objectivity and the courage to question... The emphasis of education, therefore, should be on developing in every pupil, a scientific attitude characterized by the use of scientific method of inquiry in solving problems. The curriculum should promote development in the pupil of qualities such as open mindedness, commitment to free inquiry, a habit of seeking more evidence before arriving at a conclusion and a readiness to revise assumptions and hypotheses based on fresh evidence coming to light, all directed to the inculcation of scientific temper."

The aims of teaching science according to this document are: 'developing well defined abilities in cognitive, affective and psychomotor domains such as spirit of inquiry, creativity, objectivity, the courage to question and aesthetic sensibility.'

Various educationists have highlighted the importance of science education for an individual at the personal and social level. According to Ganguli and Vashishtha, "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, however unsettling 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 the techniques of observation and experimentation in handling problems 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 a society, which is free from poverty, hunger, disease and evils such as violence, exploitation, oppression etc.

1.3 Means to achieve the aims and objectives of education.
Suitable curricula are designed to achieve the aims and objectives of education at different levels. It is the curriculum that specifies the objectives in behavioural terms and suggests appropriate content, transactional strategy and evaluation techniques.

A well-defined curriculum acts as a smooth road (content based on specific objectives) with necessary road signs (transaction and evaluation strategies), which facilitate the road users (teachers and students) to reach the destination (desired learning outcomes).

Designing a good curriculum does not ensure the achievement of all its objectives. A lot depends on curriculum transaction or the teaching-
learning process. A very well developed curriculum can prove to be useless if it is poorly transacted. Therefore, curriculum transaction is a major factor contributing to the achievement of aims and objectives of education.

1.4 The Process of Teaching.

Presenting the curricular material to the students (by the teacher) in the form of effective learning experiences by organizing suitable teaching-learning activities is called teaching.

"The core of the teaching process is the arrangement of environments within which the students can interact and study how to learn." (Dewey 1916)

There is a reciprocal relationship between teaching and learning. Teaching facilitates learning and the amount of learning facilitates to plan further teaching.

The concept of teaching has a meaning only when it is associated with learning. So, the main objective of teaching is to facilitate learning.

There is a difference between the process of teaching and the process of learning (Gage, Bruner). The process of learning is descriptive whereas teaching is a prescriptive process, which sets forth rules concerning the most effective ways of helping children to achieve knowledge and skills.

Amidon (1967) describes teaching as an interactive process: "Teaching is an interactive process primarily involving classroom talk which takes place between the teacher and students and both are benefited by this."

Joyce and Weil (1985) have defined teaching as "a process by which teacher and students create a shared environment, sets of values and beliefs, which in turn colour their views of reality".

The process of teaching is a complex one. It involves a number of acts, which are taken by the teacher during different phases like planning.
instructing, measuring and evaluating. These acts can be classified as under:

<table>
<thead>
<tr>
<th>Logical Acts</th>
<th>Planning Acts</th>
<th>Managerial Acts</th>
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<tbody>
<tr>
<td>Inferring</td>
<td>Diagnosing</td>
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<td>Explaining</td>
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<td>Instancing</td>
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<td>Interaction</td>
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Theories of Teaching.

According to Gage (1963,p133), a theory of teaching should answer three questions: -

How do teachers behave?

Why do they behave as they do?

What are the effects?

Gage (1964,p272) further states that a theory of teaching should be “a general concept which applies to all teachers, to all students, to all subject matter, and to all situations, both in and out of the school, in which teaching may occur. It should consider the behaviour of teachers, the cause, and the learning of students, the effect”.

Though various educationists (Barr, Flanders, Gage, Ryan, Smith, Stiles) have worked towards formulating a theory of teaching, we still do not have a theory of teaching which meets the conditions listed above.

It is very difficult to have a single theory of teaching as it embraces “far too many kinds of process, of behaviour, of activity, to be the proper subject of a single theory.” (Gage, 1964,p274)

1.6 Models of Teaching.

Though we do not have a well-defined theory of teaching, we do have its prototypes, called the models of teaching. The best substitute for a theory of
teaching is a model of teaching. Models are prototypes of theories because they make possible our early conceptualization and study of phenomenon. Unlike other theories, in their early state of development, models lack factual support. Eventually, useful models give way to empirically supported theories.

A model of teaching is a blueprint, which can be used to guide the preparation for, and implementation of teaching. Generally, a model of teaching has four components:

1. **Instructional Objectives**
2. **Entering Behaviour**
3. **Instructional Procedures**
4. **Performance Assessment**

(After Glaser, 1962, p6)

Different educationists have developed a number of models of teaching. These models are based on different learning theories and their classroom implications.

Given below is an overview of some known models of teaching:

<table>
<thead>
<tr>
<th>Morrison</th>
<th>Stallings</th>
<th>Lapp et al</th>
<th>Joyce and Weil</th>
<th>Brady</th>
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<tbody>
<tr>
<td>The command style</td>
<td>The Exploratory model</td>
<td>The classical model</td>
<td>Information processing model</td>
<td>Exposition model</td>
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<td>The talk style</td>
<td>The group process model</td>
<td>The technological model</td>
<td>Personal models</td>
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<tr>
<td>The reciprocal style</td>
<td>The cognitive developmental model</td>
<td>The personalised model</td>
<td>Social Interaction models</td>
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<tr>
<td>The individual programme (teacher's style)</td>
<td>The guided discovery model</td>
<td>The programmed model</td>
<td>The interaction model</td>
<td>Behavioural models</td>
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<tr>
<td>The problem solving model</td>
<td>The individual programme (Pupil design)</td>
<td>The fundamental model</td>
<td>The interaction model</td>
<td>Interaction model</td>
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<td>Transaction model</td>
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The most comprehensive examination of teaching models is that of Joyce and Weil. They have identified 23 models and classified them into four families on the basis of their educational impacts. These are:

1. **The Information Processing Family.**
   The models of this family have an orientation towards the information processing capabilities of pupils (ability to seek and master information, build and test hypothesis, apply what they learn in independent readings).

2. **The Personal Family.**
   This family represents models that are oriented towards the development of integrated feelings, thinking about self-the personal identity. They shape the environment around the capacity for self-education and the need to develop self-awareness and understanding.

3. **The Social Family.**
   The models in this family range from the simple processes of organizing students to work together to elaborate models that teach democratic social organization and the analysis of major social problems and critical social values and issues.

4. **The Behavioural Systems Family.**
   Models of this family are based on B. F. Skinner's learning theory. These models are used in a wide variety of applications, from teaching information, concepts and skills to increasing comfort and relaxation, decreasing phobias, changing habits and learning to control one's behaviour.

1.7 **The Study and its Rationale.**
Science is an integral part of the school curriculum up to the secondary level. The purpose of teaching science to all students up to secondary level is "to prepare younger generation to respond adequately to the need of adopting scientific outlook and approach while dealing with various problems of life" (National Curriculum Framework, 1988, p9). The science curriculum
intends to develop scientific temper and rational outlook in the students. It is expected to develop the ability of problem solving and decision-making. It aims at developing creativity, spirit of inquiry, objectivity and aesthetic sensibility among the students.

But actual classroom situation in majority of the schools is highly disappointing. Science is being taught in a most unscientific manner. For most of the students, science as a subject is 'a curricular burden' with very little use in their day-to-day life. They cram different concepts only to pass the examination. And teachers also teach with the sole objective of scoring a good 'pass percentage'. The method of teaching is mostly 'lecture method' accompanied by book reading. Answers to the questions given at the back of the book are prepared for the examination only to be forgotten later. Hardly ever a teaching aid is used for teaching and demonstrations are very rare. Most of the practical activities are explained on the blackboard. The objectives of science teaching, which are expected to be achieved through the science curriculum, are seldom realized for the want of suitable transactional strategies. Moreover, there is no effort on the part of the school or other examining bodies to evaluate the objectives other than the content achievement.

For teaching-learning process to be effective, the teacher should be aware of the objectives of teaching, the mental capacities of the children, the individual differences that are always there, the subject matter and the various teaching strategies (models) that enhance/stimulate learning. In case of science teaching, the objective of developing scientific temper should be as important as the knowledge of the content.

So, there is an urgent need to adopt suitable teaching methods with a conscious effort to help the students achieve the objectives of science teaching.

Another aspect of science teaching is the need of constant upgradation of knowledge on the part of the teacher as there is constant addition of new knowledge. Sometimes the pace of knowledge addition is so much that even
the most competent teachers are not able to match their steps with it. Therefore, the need of the hour is to prepare the students to learn (though we also have to prepare ourselves to teach). **Teaching the students 'How' to learn is very important and should be taken care of while teaching them 'What' to learn.**

“In the teaching of science, conscious deviation has to be made from the practice of imposing on the students standardized terminologies and nomenclatures. They should be encouraged to build up their own perception about natural and physical phenomenon through the discovery method which will help them understand the underlying principles first on their own. In other words, the approach to science teaching learning should be deduction method as well and not induction method alone.... Emphasis should not be on mere acquisition of knowledge but use of scientific method as a tool of acquiring knowledge. ‘How’ is as important as ‘What’” (Report of the Committee for Review of National Policy on Education, 1986).

The same views are expressed in the UNESCO document ‘Learning to be’: - “The never ending evolution in science makes traditional methods of teaching it less and less acceptable. We cannot hope to absorb the knowledge explosion by cramming brains with more scientific facts and by removing outdated subjects from the curriculum. Science must not be turned into a mere scholastic exercise. On the contrary, science teaching should be based on a pragmatic search for solutions to problems arising out of the environment, either directly from reality or derived from models (of teaching).”

There have been several research studies related to teaching of science through information processing models. However these studies are confined only to the achievement in science. Most of the researchers have taken up one model from the information processing family and compared it with the traditional methods in terms of students’ achievement. Tamthai (1982) studied the effect of Advance Organizers on achievement in science. Mike

Some of the researchers have compared two models of the same family with each other and with the traditional method. Pandey (1986) studied the effects of Advance Organizer Model and Inquiry Training Model on achievement in social science. Sushma (1987) studied the effectiveness of Concept Attainment Model and Biological Science Inquiry Model for teaching biology to class viii students. Baveja (1988) compared the effectiveness of Concept Attainment Model, Inductive Thinking Model and Traditional method on the achievement of students in biology. Talat Aziz (1990) studied the comparative effectiveness of Information Processing Models in developing certain concepts in chemistry at secondary level. Tabassum Raina (1994) studied the effectiveness of Advance Organizer Model and Biological Science Inquiry Model in teaching of biology.

A very few studies have gone beyond the achievement in science. They have studied the impact of information processing models on personality traits like creativity, problem solving ability and the reasoning ability. Archana Aloni (1993) studied the effectiveness of Inquiry Training Model in developing scientific attitude among the students. Gupta N.K. (1993) assessed the differential effectiveness of Concept Attainment Model, Inductive Thinking Model and Inquiry Training Model on mental processes and attitude towards science through science teaching at class ix stage.

Talking about the models of teaching and their effects, Joyce and Weil suggest, "For maximum effect, these models are used in combinations...The most effective teachers need to master a range of
models and prepare for a career-long process of adding new tools and polishing and expanding their old ones”. While reviewing various research studies related to models of teaching and science teaching, the researcher has not come across any study, which has tried to study the effectiveness of two or more than two information processing models when used in combination. Neither she has come across any study, which tried to find out the effectiveness of a particular teaching strategy on the achievement of the objectives of science teaching at the secondary stage. The present study has therefore, been undertaken to study the effectiveness of Information Processing Models in achieving the objectives of teaching science.

1.8 The Problem

The research problem has been defined to find out whether the information processing models when used in combination, could be more effective than the traditional lecture method in achieving the objectives of science teaching at secondary level. The problem seeks to answer the following set of questions:

1. Whether the information processing models of teaching could enhance scholastic achievement?
2. Whether the information processing models of teaching could increase the reasoning ability of students?
3. Whether the information processing models of teaching could develop the spirit of inquiry among the students?
4. Whether the information processing models of teaching could foster creativity in the students?
5. Whether the information processing models of teaching could enhance the decision-making ability of the students?
6. Whether the information processing models of teaching could be effective in developing rational outlook?
7. Whether the information processing models of teaching could make the students objective?
8. Whether the information processing models of teaching could enhance the aesthetic sensibility of the students?
9. Whether the information processing models of teaching could develop the courage to question in the students?
10. Whether the information processing models of teaching could increase the ability of the students to derive conclusions?

To seek answers to the questions listed above, the problem is stated as "An Experimental Study to Assess the Impact of Information Processing Models on the achievement of objectives of science teaching at secondary level".

1.9 Definitions of Key Terms.

Experimental Study:
A study in which a specific treatment is given to the subjects under study in order to find out the effect of a variable under consideration on other variables under controlled conditions and the hypothesis is tested on its basis.

Information Processing Models.
A model of teaching can be defined as an instructional design, which describes the process of specifying and producing particular environmental situations, which cause the students to interact in such a way that a specified change occurs in their behaviour.

Models of teaching help the students to acquire new information ideas skills, values, and way of thinking and also teach them 'how to learn'.
Information processing models emphasise ways of enhancing human being's innate drive to make sense of the world by acquiring and organising data, sensing problems and generating solutions to them, and developing concepts and language for conveying them. Some models provide the learner with information and concepts, some emphasise concept formation and hypothesis testing, and still others generate creative thinking. A few are designed to enhance general intellectual ability. Many information processing models are useful for studying the self and society, and thus for achieving the personal and social goals of education.

Objectives of Science Teaching.

Objectives of science teaching taken up in this study (on the basis of National Policy of Education, 1986 and National Curriculum for Elementary and Secondary Education- a framework, 1988) are:

The development of:

i. Knowledge and understanding of the concepts, principles and processes. It covers the science curriculum specified for secondary classes by NCERT.

ii. Ability to think logically (Reasoning ability).

It means logical and coherent thought, which is different from imagination. It is the problem solving process associated with cognitive operation, i.e. rational functioning by integral mental faculty. Reasoning may be inductive or deductive. Inductive reasoning is concerned with giving simple postulates, truth, principles or classification while deductive reasoning concerns testing well formed hypothesis systematically; arriving at solutions logically.

iii. Creativity.

According to Ausubel, creativity is "rare and unique talent in a particular field of endeavor". He says, "creative achievement... reflects a rare capacity for developing insight, sensitivities, and appreciation in a circumscribed content
area of intellectual or artistic activity." The creativity (creative thinking of a person is expressed in terms of his/her creative abilities. The distinctive aspect of creative thinking is divergent thinking, which is characterized by, among other things, flexibility, originality, and fluency (Guilford).


The term "rational attitude" is defined as "freedom from superstitions and fatalism and open-mindedness". The person possessing "rational outlook" will be the one "who is free from superstitions and fatalism and does not blindly accept traditions. He is logical/ reasonable in his approach and tries to see logic behind every act. He demonstrates open-mindedness by considering the ideas presented by others and is always ready to change the viewpoint when a contradictory evidence is available".

v. Objectivity.

Objectivity means the characteristic of a person to remain unbiased in every situation. An objective or unbiased person is honest, clear and precise. He/she is not easily carried away by emotions. He/she has no preconceived notions unless they have basis in his/her objective understanding of the problem. His/her acts and interpretations are free from all sorts of biases.

vi. Spirit of inquiry.

Spirit of inquiry or inquisitiveness is the ability of an individual to make inquiry. It refers to the quest of an individual for truth/logic/new knowledge. This inquest is reflected in the behavior of an individual as his/her questioning habit and an innate desire to find the answers through observation, experimentation and other techniques. Therefore, an inquisitive person is a keen observer as well. He/she is interested to verify the cause and effect relationship behind every phenomenon that he/she comes across in his/her daily life.
Inquisitiveness is a mental process and is a dimension of creativity or intelligence (Guilford et al 1952). The innate desire of a person to know more and more is a result of interactive mental processes. Presentation of a particular situation acts as a discrepant event for spirit of inquiry.

vii. **Ability to make decisions.**

Decision-making involves selecting one particular course of action out of several options available. It is a difficult task since a person has to compare and analyze several courses of action and finally select one. A person who has decision-making ability has critical and analytic thinking and confidently selects one course of action and is ready to face risks, if any, that may come afterwards.

viii. **Courage to question.**

A person who has courage to question is self-confident and has an optimistic outlook. A courageous person stands for truth even at the expense of losing his/her popularity. He/She writes letters to authorities to redress grievances of the community. He/She develops leadership qualities to shoulder the challenges of civic and social responsibilities stands for the rights of backward and the underprivileged and fights against social evils such as hoarding, bribery, and corruption.

ix. **Ability to draw conclusions.**

An important step of scientific method of solving a problem is arriving at a conclusion. This is done by systematically arranging and analyzing available data. It requires Knowledge and understanding of the subject, logical thinking and an objective outlook.

x. **Aesthetic sensibility.**

Aesthetics (Greek word—"aesthetikos" meaning perception or having to do with perception.) is the science of sensuous knowledge. It is a balancing force in life. Man's emotional and intellectual life is largely guided by it. Aesthetics is
concerned with beauty and the beautiful. The true aesthetic principle recognized by Hellenic antiquity in general is unity in variety. Greek philosophy is inclined to select form, ratio, or proportion as the pure and typical embodiment of beauty.

"Balance and symmetry, proportion and rhythm are basic factors in experience... they imply grace, economy and efficiency". (Herbert Bond, 'Education through art'. p.61)

For the measurement of aesthetic sense, the aesthetics is analyzed as follows -

i. Sense of pattern.
ii. Sense of symmetry.
iii. Sense of form.
iv. Sense of rhythm.
v. Sense of radiation.
vi. Sense of balance.
vii. Sense of proportion.
viii. Sense of color.

1.10 Objectives of the study.

To find the relative effectiveness of teaching through Information Processing Models and Traditional method* on the development of:

1. Knowledge and understanding of the concepts, principles and processes
2. Ability to think logically.
3. Creativity.
4. Rational outlook.
5. Objectivity.
7. Decision-making ability.
9. Ability to draw conclusions.
10. Aesthetic sensibility.

*Traditional method in this study means lecture method.
1.11 Hypotheses

H01 There is no significant difference in the achievement scores of pupils taught through Information Processing Models and Traditional method.

H02 There is no significant difference in the logical thinking ability (reasoning ability) of pupils taught through Information Processing Models and Traditional method.

H03 There is no significant difference in the creativity of pupils taught through Information Processing Models and Traditional method.

H04 There is no significant difference in the rational outlook of pupils taught through Information Processing Models and Traditional method.

H05 There is no significant difference in the objectivity of pupils taught through Information Processing Models and Traditional method.

H06 There is no significant difference in the spirit of inquiry of pupils taught through Information Processing Models and Traditional method.

H07 There is no significant difference in the decision-making ability of pupils taught through Information Processing Models and Traditional method.

H08 There is no significant difference in the courage to question of pupils taught through Information Processing Models and Traditional method.

H09 There is no significant difference in the ability to draw conclusions of pupils taught through Information Processing Models and Traditional method.
There is no significant difference in the aesthetic sensibility of pupils taught through Information Processing Models and Traditional method.

1.12 Assumptions:

- Schoolteachers can understand the nature of models of teaching, their phases and steps.
- Teachers can appreciate the role of different models of teaching in improving the teaching-learning process.
- Teachers can be trained to plan lessons according to various models of teaching.
- Teachers can be trained to modify their behaviour as per the requirement of a particular model.
- Teachers can be trained to generate favourable environment for using a specified model of teaching in their classrooms.
- Teachers can arrange all the materials required for implementing a particular model in the classroom.

1.13 Delimitations.

- The study was confined to only four models of the Information Processing family (concept attainment, inductive thinking, inquiry training. and advance organizer).
- Only nine chapters of the science syllabus were covered in the study.
- The experiment was conducted on the students of class IX only.
- The study was conducted only on the girl students.
- The experiment was conducted on only one school of Delhi (Salwan Girls Senior Secondary School – a government aided school).