CHAPTER - I

INTRODUCTION

Teaching is as old as the human race. The period of infancy and childhood of human species is related to the need for teaching to prepare the child to occupy a place in society. Modern man is living in a dynamic world. He has to be educated in such a way as to adjust himself to the tempo of present day society. He should be enabled to know his rights and duties, privileges and responsibilities, so that he can profit by the societal contribution on one hand and benefit the society on the other hand by his unique abilities.

The impact of philosophical, psychological, sociological and scientific innovations on education are so great that changes in educational theories and practices are necessary to re-adjust these with changing concepts and growing needs of the nations.

Now teaching has acquired the status of a profession. Teacher's responsibilities are not only to impart instructions, they are expected to be responsible for the personal growth of students, their social development and preparation for national and inter-national citizenship,
and for their mastery of academic subjects including basic skills of reading and computation that are very essential for contemporary life. To carry out these multiple responsibilities teachers are required to engage in several professional roles, simultaneously teachers are counsellors, facilitators, instructional managers, curriculum designers, academic instructors, evaluators of instructions and disciplinaries. All these different roles required different teaching strategies.

The professional competence in teaching can be increased in two ways: first, by increasing the range of teaching strategies that the teachers are able to employ; second by becoming increasingly skillful in the use of each of these strategies.

Moreover there are presently available to us many alternatives for organising and carrying out learning experiences that is 'Models of Teaching' - some are formal, and other casual and emergent. These are based on theories about how people learn, grow and develop. Some of these theory based models of teaching are more appropriate to some objectives than to others. Some are specially tailored to help students to grow in self-awareness and strength or self concept, others are more useful for improving human relations in the classroom and helping students to clarify their values. Yet others are more appropriate for the mastery of subject matter, and still other models of
teaching can improve the information processing capacities of students.

Some philosophies of teacher education maintain that a teacher should master a single model and utilize it well. However, very few teachers in reality, follow this single model pattern. A highly skillful performance in teaching blends the variety of models appropriately and embellishes them. Master teachers create new models of teaching and test them in the course of their work. Thus growth in teaching is the increasing mastery of a variety of models of teaching and the ability to use them effectively. This will certainly ensure the development of intellect, which is, after all, a primary goal of schooling.

Teaching science through inquiry approach emphasizes investigative process so that students learn science as a process and understand the empirical basis of scientific evidence. Teaching by inquiry involves identifying problems, observing, measuring, classifying, discovering meaningful pattern, designing experiments, interpreting, analyzing and data verifying. The psychological basis of inquiry is the active involvement of students in the process of learning. The important aims of inquiry are the development of scientific concepts useful in understanding the natural environment, the acquisition of process skills and the development of the habit of scientific thinking.
For many years the science education community has advocated the development of inquiry skills as an essential outcome of science instruction and for an equal number of years science educators have met with frustration and disappointment. In spite of new curricula, better trained teachers, improved facilities and equipment, the optimistic expectations for students becoming inquirers have seldom been fulfilled.

Inquiry is a way of thought. Scientific inquiry, a subset of general inquiry, is concerned with the natural world and is guided by certain beliefs and assumptions.

The domain of inquiry is divided into three main themes: Science process skills, the nature of scientific inquiry, and general inquiry process.

Within the theme "science process skills" are included the observing and measuring, seeing and seeking solutions to problems, interpreting data, generalizing and building, testing and revising the theoretical models and development of skills in using common laboratory equipment and performance of common laboratory techniques.

1.1 MODELS OF TEACHING

The best substitute for a theory of teaching is a model of teaching. Teaching models suggest how various teaching and learning conditions are interrelated. Models are usually prototypes of theories because they make possible our early conceptualization and study of phenomena.
Unlike theories, in their early state of development, models lack factual support (Dececco and Crawford, 1977). Some educationists have viewed different theories of teaching from their practical perspectives, as a result of which, some models of teaching have been developed.

A 'model of teaching' as a pattern or plan which can be taken to shape curriculum or course to select instructional materials. Silverman differentiate a theory and a model of teaching - A theory is a system in which the interactions among actual variables are explained, whereas a model is an analogy and is evaluated by its utility.

Joyce Bruce and Marsha Weil (1972) have defined the term in their book 'Models of Teaching' as follows:

"Teaching models are just instructional design. These describe the process of specifying and producing particular environmental situations which cause the student to interact in such a way that specific change occur in his/her behavior".

Bruce and Weil (1980) have further clarified the term in their book 'Information Processing Models of Teaching'. A model of teaching consists of guidelines for designing educational activities and environments. It specifies ways of teaching and learning that are intended to achieve certain goals. A model includes a rationale, a theory that justifies it and describes what it is good for, and why; the rationale may be accompanied by empirical
evidence that it works.

The models of teaching are very useful for teachers for planning and organising teaching activities. The teacher can make its use in planning curriculum, student teacher interaction, preparing guideline for guiding students activities and to develop specific teaching aids. These models are also helpful in formulating, developing and evaluating the theories of teaching.

Weil and Bruce has warned that a model or teaching is not a fixed formula for completing a job. It provides definite ideas for creating an environment from which students are likely to learn certain kind of things, but it has to become a flexible, fluid instrument that is modified to fit different types of subject matter and that responds to students who are different from one another that is unique entities.

1.2 TYPES OF MODELS OF TEACHING

Teaching models suggest a variety of sources. Philosophers such as James (1899), J.Dewey (1916), & Broudy (1965), Psychologists such as Piaget (1952), Kohlberg (1966) and Hunt (1971), and learning theorists such as Skinner (1957), Ausubel (1963) and Bruner (1966), have developed a large number of approaches to teaching and learning. John P. Dececco and W. Crawford (1974) have discussed three psychological models of teaching namely: (i) A basic Model of Teaching by R. Glaser; (ii) A Computer-Based Teaching
model by L. Stolurow and Danial Davis; (iii) An interaction model by Ned. Flanders. He has also described three historical models of teaching such as (i) Lecture-recitation model; (ii) the montessori model and (iii) the human relations model by Combs and Snygg. John Dececco considered the Glaser model as the basic model of teaching and compared all other models with it.

Marsha Weil and Bruce Joycee (1972) have classified teaching models into four families. Each family contains a group of model on the basis of their chief emphasis on the way they approached educational goals and means. The various families of models, as given in their book "Models of Teaching" are as follows:

<table>
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<tr>
<th>Model Major Theorist</th>
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<tr>
<td>Social Interaction Family of Models:</td>
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<tr>
<td>i) Group investigation Model. Herbert Thelen, John Dewey</td>
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<tr>
<td>ii) Class-room Meeting Model William Glaser</td>
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<tr>
<td>iii) Social inquiry Model Byrn Massiales Benjamin Cox</td>
</tr>
<tr>
<td>iv) Laboratory Method Model National Training Laboratory (NTC) Benthel Maine</td>
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<tr>
<td>v) Juris-prudential Model Donald Oliver James P. Shaver</td>
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vi) Role of Playing Model Fannie Shaftel George Sheftel
vii) Social simulation Model Serene Boocock

Information Processing Family of Models
i) Inductive Thinking Model Hilda Taba
ii) Inquiry Training Model Richard Suchman
iii) Science inquiry Model Joseph J. Schwab & Curriculum Reform Movement of 1960's in USA
iv) Concept attainment Model Jerome Bruner
v) Developmental Model Jean Piaget irving Sigel. Edmund Sullivan
vi) Advanced organiser Model David Ausubel

Personel Family of Models
i) Non-directive Model Carl Rogers
ii) Awareness Training Model Fritz Perls
iii) Synectics Model William Gordon
iv) Conceptual System Model David Hunt

Behaviour Modification Models
Operant Conditioning Model B.F. Skinner

1.3 FUNDAMENTAL ELEMENTS OF MODELS OF TEACHING
A model of teaching has six fundamental elements namely:-
(i) Focus, (ii) Syntax, (iii) Principles of Reaction, (iv) Social system, (v) Support system and (vi) Evaluation system.

i) **Focus**

The term 'focus' refers to the goal or objectives of teaching. The teaching activities are oriented to achieve some goals which are defined in behavioural terms. It describes the aspects of the environment which are most important in the life of the students.

ii) **Syntax**

The syntax of model is structure of activities. It indicates the 'flow of activities or actions' to be followed in the model, which specify educational environment relating to each model.

iii) **Principles of Reaction**

These principles guide the teacher's responses to the learner; they tell the teacher how to regard the learner and respond to what he or she does. In some models, the teacher tries to shape behaviour by rewarding certain student activities and remaining neutral toward others. Principles of Reaction (Weil and Bruce, 1972) provide the teacher with rules of thumb by which to 'turn in' to the student and select appropriate responses to what the student does.

iv) **Social System**

It provide a description of student and teacher
roles and relationships and the kind of norms that are encouraged. The leadership roles of teacher vary greatly from model to model. So, some models are highly structured, others are moderately or less structured from the point of view of the degree of structure in the learning environment.

v) **The Support System**

It refers to the additional requirements beyond the usual human skills, capacities and technical facilities necessary to implement a model. Any additional support in the form of books, films, self instructional systems, a trained expert, audio-visual aids and other materials. Support requirements are derived from two sources: the role specifications for the teacher and the substantive demands of the experience.

vi) **Evaluation System**

The evaluation is an indispensable aspect of teaching because it produces evidences about the realization of goals of teaching model. Some of the oral tests, objective tests of recall and recognition type, questionnaires and rating scales etc. are administered to evaluate the knowledge of students.

1.4 **THEORY OF THE MODEL**

J. Richard Suchman (1962) developed this model of scientific inquiry by analysing methods employed by creative research personnel, especially physical scientists. Although it was developed in the context of the natural sciences, its
procedure have wide applicability in all subject areas. The goals of inquiry training model are to help students develop the intellectual discipline necessary to search out data, process it and apply logic to it. Every individual have a natural motivation to inquiry. This model is built upon intellectual confrontation. Suchman believed, that it is important to convey to students the attitude that "all knowledge is tentative". Scholars generate theories and explanations, years later, these are pushed aside by new theories. There is no one answer. Suchman was interested in helping students to inquire independently, but in a systematic manner.

The chief purpose of inquiry training is to make children more autonomous learners. The inquiry begins with a puzzling event - a discrepancy and students inquire into it. It is essential that teachers concern themselves primarily with creating a climate that aids inquiry. To facilitate this climate for inquiry, suchman provided six rules for conducting the inquiry session.

Rule I: The questions should be phrased in such a way that they can be answered 'yes' or 'no'. This rule does two things: it requires more precise thinking on the part of students, and it prevents them from putting the burden of thinking on the teacher through open - ended questions.
Rule II: Once called upon, a student may ask as many questions as he or she wishes before yielding the floor. Creative thinking takes time and continuity. Students should not feel pressured by other students eager to inquire.

Rule III: "The teacher does not answer 'yes' or 'no' to statements of theories, or to questions that attempt to obtain the teacher's approval of a theory". Theories are only starting points for inquiries; the teacher should encourage students to go beyond their theories to experiment and test them. There are no final answers. Scholars and scientists are always searching for better theories.

Rule IV: "Any student can test any theory at any time". Students should argue the merits of one another's theories and feel free to test all theories that have been advanced.

Rule V: "Any time the students feel a need to confer with one another without the teacher's presence they should be free to call a conference". Conferences should be brief, about four five minutes. Their purpose is to help students who are reluctant to expose their ideas to a teacher, and to facilitate the cross fertilization of ideas.
Rule VI: "Inquirers should be able to work with experimental kits, idea books, or resource books or materials at any time they feel".

The teacher guide the students to a strategy whereby their early questions are confined to data gathering stage, they ask questions about events, objects, conditions and properties. Through this information they try to find out the nature and identity of the objects, the events, the properties and conditions surrounding the puzzling situation. Thus the students are taught through experience that the first stage in a series of questions is to verify the facts about puzzling situation. As the students become aware of the properties of the data, hypotheses should come to mind and guide further inquiry. Using their knowledge about behaviour of the objects, students can turn their questions to the relationships among the variables in the situation. They can conduct verbal or actual experiment to test these casual relationships, using selecting new data or organising the existing data in new way to see what will happen if things are done differently. By introducing a new condition or altering an existing one, students isolate variables and perceive how they effect one another.

Finally, students try to develop hypotheses that will fully explain what happened. Even after lengthy and rich verification and experimentation activities, many explanations may be possible. Students express these
theories or the final explanation with different levels of sophistication and specificity. Inquiry cannot be programmed, and the range of productive inquiry strategies is vast.

The model promotes strategies of inquiry, and the values and attitudes that are essential to an inquiry mind including: Process skills (observing, collecting and organising data; identifying and controlling variables; formulating and testing hypotheses and explanations, inferring).

- Active autonomous learners
- Verbal expressiveness
- Tolerance of ambiguity, persistence
- Logical thinking
- Attitude that all knowledge is tentative.

The chief outcomes of inquiry training model are the processes involved - observing collecting and organising data, identifying and controlling variables, making and testing hypotheses, formulating explanations, and drawing inferences. The model splendidly integrates these several process skills into a single, meaningful unit of experience.

The format of the model promotes active, autonomous learning as the students formulate questions and test ideas. It takes courage to ask questions, but it is hoped that this type of risk taking will become second nature to the students. They will also become more
proficient in verbal expression as well as in listening to others and remember what has been said.

Although its emphasis is on process, inquiry training also results in the learning of content in any curriculum area from which problems are selected.

1.5 PROCESS

(a) Syntax of the Model

Inquiry Training model has five phases:

Phase One

Encounter with the problem: Explanation of inquiry procedures, present discrepant event.

Phase Two

Data gathering: Verification; verifying the nature of objects and conditions, verifying the occurrence of the problem situation.

Phase Three

Data gathering: Experimentation; isolating relevant variables, hypothesizing (and test) casual relationships.

Phase Four

Formulation of an explanation: Formulating rules or explanations.

Phase Five

Analysis of the Inquiry Process: Determining inquiry strategy and developing more effective ones.
(b) **Principles of Reaction**

The most important reactions of the teacher take place during the second and third phases. During the third phase the teacher's task is to help the students to inquire, but not to do inquiry for them. The teacher can, if necessary, keep the inquiry moving by making new information available to the group and by focusing on particular problem events or by raising questions. During the last phase, the teacher's task is to keep the inquiry directed toward the process of investigation itself. Specific principles of reaction include:

1. Insuring that questions are phrased so they can be answered by a 'yes' or 'no'.
2. Asking students to rephrase invalid questions.
3. Pointing out unvalidated statements.
4. Using the language of inquiry process for instance, identifying student questions as theories and inviting testing (experiment).
5. Neither approving nor rejecting student theories.
6. Pressing students for clearer statements of theories and more support for generalisations.
7. Encouraging interaction among students.

(c) **Social System**

Inquiry Training Model can be highly structured, with the teacher controlling the interaction and prescribing the inquiry procedures. However, the norms of inquiry are
those of co-operation, intellectual freedom and equality. The teacher should encourage interaction among students. He should also ensure that the intellectual environment is open to all relevant ideas. The teacher and students participation should be as equals where ideas are concerned.

The teacher's role in this model is to select or construct the problem situation, to refree the inquiry according to inquiry procedures, to respond to students' inquiry probes with the necessary information, to help beginning inquirers establish a focus in their inquiry, and to facilitate discussion of the problem situation among the students. After a period of time and practice in teacher-structured inquiry sessions students can undertake inquiry in more student controlled settings.

(d) Support System

The optimal support is a set of confronting materials, a teacher who understand the intellectual processes and strategies of inquiry, and resource materials bearing on the problem.

The above model has been chosen as one of the variable in the present study to see its effectiveness in terms of developing cognitive structures and acquisition of scientific process skills.

1.6 COGNITIVE STRUCTURES

Piaget originally trained as biologist uses biological analogue for much of what he says about the
development process. Keeping in view the various aspects of cognition the goals of development include:

- ability to reason abstractly;
- to think in a logical order about various hypothetical situations.
- to organise rules, which are operations in higher ordered structures.

In any cognitive encounter with the environment, assimilation and accommodation are of equal importance and must always occur together in mutually dependent way. This model of human cognitive system stresses the constant collaboration of the internal cognitive with external environment in construction and development. Piaget defines cognitive development in terms of stages. He established a sequence of age-related stages, from the sensory motor to the abstract intelligence. Each stage involves a period of attainment. He has divided the period of cognitive development into four stages - sensory motor stage (from birth to 2 years), pre operational stage (from 2 years to 7 years), concrete operational stage (from 7 years to 11 years) and formal operational stage (from 11 years to adulthood).

Bloom Taxonomy of cognitive domain includes in the comprehension process those behaviour which results in an understanding of the literal message contained within any communication. Bloom's comprehension consists of three
parts: translation, interpretation and extrapolation. Translation is behaviour that can be put a communication into another language, other terms or into other form of communication. Interpretation is a behaviour which can take a basic configuration of a communication and record them, so that a new configuration is produced. Extrapolation includes the making of estimates based upon an understanding of trends or tendencies contained within a communication.

Herber's model of comprehension uses the three levels of cognition: literal, interpretive and applied. Herber's model of comprehension can be viewed as a gradual extension of concepts in which ideas are connected and associated. However, concepts and facts are not restructured or even constructed.

1.7 REVIEW OF RELATED LITERATURE

Models of teaching have received considerable attention only recently. Very few studies have been conducted on models of teaching, however researches have been conducted on methods of teaching or on various other strategies concerned with teaching learning process. Studies having relevance to the present study are given below.

Davis Maynard (1978) in his studies reported that guided approach appeared significantly more effective than the expository text approach for upper grade elementary school students in achievement of knowledge and information.
Achievement in understanding science was slightly higher, however difference was not significant and studies with this approach expressed more positive attitudes at a significant level of difference than those expressed by the expository text group.

AWODI-SHUAIBU (1984) reported that students in inquiry group attained significantly higher level of achievement than students in traditional groups. Teaching science as inquiry significantly enhances Nigerian students' achievement in science and the inquiry method in more effective method of teaching science than traditional lecture method.

Frederick, Peter Deluca (1970) concluded that the experimental course is superior to the traditional course in promoting favourable student attitude to Geology and science. Both approaches were equally effective in term of achievement. In light of these findings one may concludes that the traditional course without a loss in students' achievement in Geology content and with significant gains in favourable student attitudes.

Oakes (1960) compared conventional method with programmed instruction and reported that no significant difference existed in achievement between two groups taught through lecture method and programmed materials.

Helms, Estelle Pailey (1980) investigated whether individually administered tasks based on the work of Jean
Piaget will be satisfactorily predictors of first grade reading, Mathematics and Science achievement. He found that tasks would serve as satisfactory predictors in reading Mathematics and Science achievement as measured by scores on achievement test.

Kent, B.R. (1974) investigated that the achievement of students taught verbal problem solving by consensus method was significantly greater than the achievement of students taught by the expository method.

Thumann (1983) investigated that students who exhibited reflective reasoning pattern, achieved higher science achievement scores and studied interaction between two methods of teaching science and students cognitive style.

Mrosola (1984) investigated that low achieving Mathematics students were more field-dependent than high achieving Mathematics students in both traditional high school and in the high school drop-outs and that there would be a significant interaction on the achievement variable and the sex variable with respect to field dependent in both schools.

Walker, A.J. (1984) reported in his study that field independent students performed higher level of initial learning, retention and time on task behaviour, irrespective of methodology. He suggested a significant main effect for cognitive style for the initial learning variable. For the
retention variable, there was also a highly significant main effect for cognitive style but no main effect for methodology.

Atang, C.I. (1985) reported in his study that individuals' field dependence/independence was not a significant factor in their performance in the pre-test and the post-test. Both the color and black and white subjects proved superior to the control group subjects in the post-test scores. There was a significant relationship between pretest and post-test time.

Elajne, J. Anderson, Hernest, T. Demelo Michael Szabo and George Toth (1975) in their paper concluded that science achievement on inquiry oriented biology material was facilitated by the use of behavioural objectives.

Wright (1977) studied the effect of school curriculum improvement study (S.C.I.S.) material on the process skills and attitudes of seventh grade students. No significant differences were found between S.C.I.S. experimental and control (traditional text-books) groups using a measure of process skills, other research indicated that teachers must significantly teach process skills if they expect achievement of them.

Mele, Frank Michael (1978) conducted research on problem solving programme's effect on college student's transition from concrete to formal thought based on cognitive development model. The researcher concluded that
experimental group using problem solving model in teaching of Biology scored significantly higher than the control group on the post-test on Piagetian concrete formal operational thought, abstract thinking, objective-subjective differential reasoning and critical thinking.

Rastogi, K.G. (1964) found significantly positive relationship between intelligence and achievement both in science and english.

Sinha, D.N (1965) found that in their intellectual capacity, the more successful students were significantly superior with mean I.Q. of 112.98 as against that of 102.49 of the low achievers.

Studies by Singh, B.N.K.(1965) revealed that academic achievement was significantly and positively related to intelligence, concept formation and academic motivation.

Rao, D.G. (1960) concluded in his study that intelligence, study habit and school attitude are significantly related to the prediction of scholastic achievement.

Varma, M (1966) revealed that intelligence had positive correlation with the achievement.

Vidhu, M (1968) revealed that the correlation between intelligence and academic preference was positive and highly significant.

Jha, V. (1970) found in his study that there was a
significant positive relationship between achievement in science and general intelligence but there was no relationship between achievement in science and extroversion.

The findings of the study by Chaudhary, N. (1971) concluded that n-achievement and intelligence were not significantly and positively related to each other.

The study by Gupta, R.C. (1972) concluded that there is significant positive correlation between intelligence and achievement in mathematics.

Vasantha (1972) investigated into the work values of students in relation to their intelligence, achievement and socio-economic status.

The findings of the investigation by Rao, S.N. (1983) revealed that the high and low achievers did not show significant difference in general ability.

Mansfield (1960) investigated the relationship between intelligence and concept acquisition have yielded contradictory results. Tasks and dependent variables are not comparable from study to study. He reported significant correlation between concept scores and intelligence scores.

Pathak, A.B. (1972) revealed in his study that the high achievers had a significant higher I.Q. (131.2) than the lower achievers.

BOONTAE KHWANTA (1984) concluded that inquiry approach is well suited for use in science since this approach is similar to the method by which much of the
scientific knowledge was discovered. In addition Piagetion-based instructional concepts augment the inquiry approach to teaching by focusing on the students intellectual development.

Macmeen (1982) reported that both students who had exposure to a traditional chemistry program and students who had an inquiry oriented laboratory based chemistry program showed equivalent increases in intellectual development as measured by TOLT (Test of Logical Thinking).

MULOPO, MOSES MUYATMA (1983) concluded that traditional approach might be appropriate for teaching scientific facts and principles, while the discovery approach tended to be effective in promoting scientific attitudes and understanding about science among formal reasons) intellectual development seemed to be related to achievement and understanding science but not to scientific attitudes.

Bock, James Samuel (1979) reported that there was no significant difference due to either main or interaction were found when attitudes or attitudinal changes were compared, there was a significant difference between the experimental and control group on the applications of sub-test (of the ACS-MSTA). This aspect of the study is encouraging because similar results were obtained by Herror, when he compared CHEM study students with the traditional chemistry students.
Salim, Mohamed. Ahmed Mohamed (1981) reported that students taught by the discovery method made significantly higher scores in total science achievement, recall and application than students taught by expository method. Students taught by the discovery method made significantly higher scores in science attitudes than students taught by expository method.

Serlin (1976) concluded that the method used was effective at improving students science process skills. Evidence was also presented which suggested that the goal has not been successfully attained within the context of the traditional physics laboratory.

Garbally (1974) studied the effectiveness of science inquiry lessons on the development of the skill of classification in inner city kindergarten children. The study attempted to answer the questions - (i) Do the science inquiry lessons affect the classification behaviour of the children? (ii) Will the children involved in the science inquiry lessons retain any increased ability to classify three months after the termination of the lessons?

The study concluded that the science inquiry lessons will produce no significance change in classification development and it can be altered by lessons which emphasize concrete experience with objects. The increased ability to classify the children who participated in a follow up study which occurred three months after the
lessons were terminated.

Everett, Sherman STALLINGS (1973) concluded that the ISCS program as used by the teachers involved in this study does not produce clear gains in inquiry skills of students as measured by Tab Test. Due to low test reliability caution must be exercised in interpreting the results of the study.

Robert, William Beery (1972) concluded if a major objective of social study education is the development of inquiry skills and sociological concepts and generalizations these objectives can be accompanied by using either of inquiry teaching strategies employed in the investigations.

MAHER, HENRY PAUL (1982) concluded that Math ability, reading ability, field dependence - independence were significant predictors of achievement, locus of control and method were not significant main effects.

RODRIGUEZ, IMELDA ZAPATA (1981) concluded that participation in the science inquiry lessons facilitated the development of classification skills and oral communication skills of bilingual children.

1.8 EMERGENCE OF PROBLEM

A critical review of the research studies revealed that a number of methods of teaching have been developed for teaching different subjects at different levels. The most of the modern curricular designers for school curriculum have stressed the need for the development of
cognitive structures and process skills among students. This is based on the fact that main aim of education is to prepare the individual for later life. In complex society every individual will be facing a large number of problems daily and his adjustment will depend upon his capabilities to solve problems successfully. The main stress of the educator is to provide such opportunities to the students so as to develop cognitive structures and the process skills. This emphasis has motivated the investigator to take the present study which involve development of cognitive structures and acquisition of process skills through inquiry training model for effective science teaching.

Very few studies have been undertaken regarding inquiry training model and its effectiveness in comparison to expository traditional method of teaching in science. Most of the researches conducted have tried to analyse and examine inquiry method of teaching with expository method of teaching at different stages and in different periods. Few studies have been conducted taking intelligence as independent variables. Very few studies have been conducted in development of cognitive structures and acquisition of process skills through different strategies of teaching.

The present study was undertaken to study its efficacy in terms of development of cognitive structures and acquisition of process skills.
1.9 STATEMENT OF THE PROBLEM
EFFECTIVENESS OF INQUIRY TRAINING MODEL OF TEACHING ON COGNITIVE DEVELOPMENT AND ACQUISITION OF PROCESS SKILLS IN RELATION TO SELF CONCEPT AND INTELLIGENCE.

1.10 OBJECTIVES OF THE STUDY
1. To study effectiveness of inquiry training model as compared to conventional mode of instruction.
2. To study whether teaching strategies interact with the levels of intelligence or not.
3. To study whether teaching strategies interact with self concept or not.
4. To study whether the self concept of learner is related to cognitive structures and acquisition of process skills or not.
5. To study whether intelligence of learner effects the development of cognitive structures and acquisition of process skills.
6. To train students in the process of making scientific inquiry.

1.11 HYPOTHESES
The present study will be conducted to test the following hypotheses:

1. a) There will be no significant difference in terms of mean scores on cognitive structures test between groups exposed to inquiry training model and conventional method of teaching.
b) There will be no significant difference in terms of mean scores on acquisition of process skills test between groups exposed to inquiry training model and conventional method of teaching.

2. a) There will be no significant difference between mean scores of high and low self concept groups on the cognitive structures.

b) There will be no significant difference between high and low self concept groups with respect to acquisition of process skills.

3. a) Intelligence does not effect significantly the development of cognitive structures irrespective of the teaching model.

b) Intelligence does not effect significantly the acquisition of process skills irrespective of the teaching model.

INTERACTIONAL HYPOTHESES

FIRST ORDER

1. a) There will be no significant interaction between levels of self concept and teaching strategies in the development of cognitive structures.

b) There will be no significant interaction between levels of self concept and teaching strategies in the acquisition of process skills.

2. a) There will be no significant interaction between levels of self concept and levels of intelligence
in the development of cognitive structures.

b) There will be no significant interaction between levels of self concept and levels of intelligence in the acquisition of process skills.

3. a) There will be no significant interaction between levels of intelligence and teaching strategies in the development of cognitive structures.

b) There will be no significant interaction between levels of intelligence and teaching strategies in the acquisition of process skills.

SECOND ORDER INTERACTION

1 a) There will be no significant interaction among the variables of teaching strategy, self concept and intelligence in the development of cognitive structures.

b) There will be no significant interaction among the variables of teaching strategy, self concept and intelligence in the acquisition of process skills.