REVIEW OF RELATED LITERATURE

This chapter on the review of related literature is intended to reveal the various research works on the topic areas of relevant theories of instruction, instructional strategies developed and different models of teaching. The studies incorporated in this chapter is in the following heads: Relevant theories of instruction, Instructional Strategies in General and Models of Teaching.

2.1 Relevant Theories of Instruction

Teaching methods are recurrent instructional processes, applicable to content of various subjects offered in educational institutions and usable by more than one teacher. These instructional processes promote student learning of different kinds in various subjects. The core of teaching process is the arrangement of environments within which the students can interact and study how to learn (Dewey, 1916). A Model of Teaching as explained by Joyce and wel(1997) is description of a learning environment.

According to Gagne(1976) a model of learning has the function of identifying the structures and processes that need to be taken into account in giving an adequate rational explanation for the learning event. These structures and their associated processes are derived as hypothetical constructs from empirical research findings by means of rational
inference. Thus a model is merely the beginning of a learning theory. In fact alternative theories of individual processes or combination of processes may be equally compatible with a given model.

Two kinds of theory of teaching are suggested by Gage (1964). The first one explains why teachers behave as they do in teaching. The second kind of theory explains how the behaviour of a teacher can influence the learning of the pupils. According to Bruner (1966) a theory of instruction has four major features. Firstly, a theory of instruction should specify the experience which should implant effectively in an individual a predisposition towards learning. Secondly, a theory of learning should be structured so that it is readily grasped by the learners. Thirdly, the theory should specify the most effective sequence in which the materials to be learned by the learners should be presented. Finally, the theory should specify the nature and pacing of reward and punishment in the process of teaching and learning.

Development of intellectual capabilities and acquisition of contents are considered as the major goals of information processing (Eggen, Kauchak and Harder, 1979). According to them, the intellectual skills or capabilities required to analyse information are called processes. The intellectual skills include ability to make observations and to generalise, to predict and to explain events through the use of inference. The knowledge that results from the processing of information is called content.

Ausubel is also one of the few educational psychologists to address learning, teaching and curriculum, simultaneously. His theory of meaningful verbal learning deals with three concerns, how knowledge is organised, how the mind works to process new information and how the teachers can apply these ideas about curriculum and learning when they present new materials to students. According to Ausubel there is a parallel between the way subject matter is organised and the way people organise knowledge in
their minds. He expresses the view that each of the academic disciplines has a structure of concepts (and for propositions) that are organised hierarchically (Ausubel, 1963:18) That is, at the top of each discipline are a number of very broad, abstract concepts that include more concrete concepts at lower stages of organization.

Piaget’s philosophy of development has gained increasing popularity with educators. He believes that human beings develop increasingly more complex level of thinking in definite stages. Each stage is characterised by the possession of certain concepts or intellectual structures which he refers to as ‘Schemas’. Schemas organise the world in some way; they are the programmes or strategies that the individual use as they interact with the environment. In the course of life, students acquire experience. They assimilate this experience to their present pattern of behaviour. Then they develop new Schemas by accommodating to the new information (Piaget, 1952)

Inquiry training originated in a belief in the development of independent learners; its method requires active participation in scientific enquiry. The individual have a natural motivation to enquire. They can also become conscious of and learn to analyse their thinking strategies. New strategies can be taught directly and added to the students existing ones. Co-operative inquiry enriches thinking and helps students to learn about the tentative, emergent nature of knowledge and to appreciate alternative explanations (Suchman, 1962)

2.2 Instructional Strategies in General

Education is considered as a process of modification of behaviour of the educand in a desirable direction. As a result of educating the pupils they acquire a particular type of behaviour that represents the desired changes. What is desired, must find a place
in the learning outcomes, we expect after the pupil has undergone instruction. Objectives are based on 1) students' needs and capabilities 2) specific demands of the society 3) nature of the subject matter.

Some methods are more effective for developing skills than scientific knowledge. The laboratory method, for example, is efficient in teaching students how to perform specific tasks in an experiment such as bending glass tubing merely from hearing a lecture on the subject. He must be given an opportunity to develop skills in the laboratory.

Many science teachers will argue the use of the lecture demonstration method as compared with the individual laboratory method in terms of superiority.

By means of the developmental approach, an experiment or indeed any kind of science problem is made to take a new aspect. It is dependent upon inductive and deductive reasoning. Hunter (1934) writes: Interest is obtained by constant interaction between the mind of the teacher on the one hand and that of the student on the other. Close oral questioning which leads to the formulation of the problem and the fact that pupils have an oral as well as visual approach to the work in hand make for greater activity and interest.

The project method is employed by the science teacher to provide for the needs of the individuals or small groups of students. This method is more effective for good learning situation in science when the undertaking is conceived and ultimately carried through to its final stages by the student. The science teacher may inspire the birth of the idea or project and may encourage as well as nourish all of the learning activities that are associated with the final development of the project.

An individual is confronted with a new situation, or with a modification of an existing situation, such that a problem or challenge is presented. The individual, if he is proceeding in a practical way, surveys the situation as well as he can. He draws his own
past experience and the experience of others for whatever may be as upon the problem. Then he sets up one or more tentative solutions to the problem and tries these out. He repeats these procedure again and again, until he finds a workable solution. It is only through the exercise of problem solving and the effort of discovery that one learns the working heuristics of discovery, and the more one has practice, the more likely is one to generalise what one has learned into a style of inquiry that serves for any kind of task. Greater gains in achievements were noted each instance when the group used problem solving method in the study conducted by Carpenter (1960). Studies done by Van Deventer (1958) and Bruner (1961) also support the superiority of problem solving method.

Another group of researchers tried to find out the teaching patterns which are conducive for developing cognitive and affective behaviour. It is generally agreed that the objectives generally achieved through the teaching process are multidimensional in nature. It is also felt that a particular method or technique may not be appropriate for achieving the multidimensional objectives. This led researchers to explore the use of various methods and techniques in an integrated fashion which resulted in the development of new instructional strategies. The greatest emphasis was on the development of cognitive domain. Cybernetic approach to instruction acts as a connecting link between Information Processing Communication and Control. The survey conducted by Jose (1980) provided adequate evidence to show that the goals and dynamics of Information processing can be applied with appropriate modifications to instructional situations, so that the efficacy of instruction can be increased several fold. The result of the study by Lazarowitz (1976) showed that teachers who use new programmes like BSCS, PSSC, CHEM study etc. in their teaching activities have more favourable attitudes towards inquiry strategies than the non-users of these programmes.
In India during the last few decades, efforts have been made to study the classroom behaviour of teachers through Flander's Interaction Analysis Category System which equips them to change their behaviour so that development in the cognitive and affective domains of pupils can be brought in. Efforts were also made to identify teaching skills for teaching different subjects. Also the micro teaching technique was researched for improving upon general teaching competence. Studies conducted on Modular approach by Hazeena (1995) Ancy Varghese (1995) and K. Mohmmad Ali (1996) showed its superiority compared to the traditional method of teaching.

It seems to be a matter of taste rather than reason, which method of teaching is best. What induces one to find the efficacy of a particular method or instructional strategy is not clear. In the studies Muddu (1978) found motion pictures, Exemmal (1980) found an environmental approach Yadav (1984) found Mastery learning strategy, Pillai (1987) found gagne's conditions of learning more effective than the traditional method of teaching science. Dighal (1985) discovered that two or three method when combined gave better results than any one in isolation. Joshi (1987) and Lambhate (1987) developed instructional strategies for science teaching and found them effective.

On the basis of studies presented in this category it may be said that the conventional method of teaching different subjects at various levels was found to be less effective than various innovative teaching patterns like programmed instruction, instructional strategies and Models of Teaching in terms of achievements of students. All these efforts did little for achieving the all-round development of the personality of the child. In other words cognitive, affective and psychomotor behaviour must be developed in a balanced and integrated fashion. Models of Teaching have great potentiality for achieving this goal of education.
2.3 Models of Teaching

Since teaching aspect has relatively been neglected the theory/theories of teaching have not so far been evolved by researchers. In the absence of a theory of teaching, the question arises as what procedures a teacher should follow in the classroom, or whether he should be allowed to develop a teaching style that works in his work situation. It is true that theory/theories of teaching are not available as yet, but there are a number of Models of Teaching which have been developed by researchers to realise specific instructional goals. These Models of Teaching have been developed on the assertion that a single best way to teach does not exist and as such different Models of Teaching are required to realise different instructional goals. Thus a teacher, to be effective, should be able to recognise different kinds of instructional goals and select appropriate teaching models to realise the specific instructional goals. Researchers have not paid adequate attention towards teaching aspect. As a result very few Models of Teaching have been evolved. Dececco (1968) making distinction between teaching models and a theory of teaching says that models do not have the vigour of tested theories. Some useful models may eventually give way to empirically tested theories.

Eggen, Kauchak and Harder (1979) have discussed six Information Processing Models - General Inductive Model, Concept Attainment Model, Inquiry Training Model, Taba Model, General Deductive Model, Advance Organiser Model. The most comprehensive review of teaching models is that of Joyce and Weil (1980) who have identified 23 models which are classified into four basic families - Information Processing Models, Personal Models, Social Interaction Models, and Behavioural Modification Models. Information Processing Models emphasise ways of enhancing the human beings 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. The model of inductive thinking is an adaptation from the work of Hilda Taba (1966) and others like Schwab (1965), Tennyson (1986), and Cocchiarella (1986) who have studied how to teach students to find and organise information and to create and test hypotheses describing relationships among sets of data. Mnemonics are strategies for memorising and assimilating information. Teachers can use mnemonics to guide their presentations of materials, and they can teach devices that students can use to enhance their individual and co-operative study of information and concepts. This model has been tested over many curriculum areas and with students of many ages by Pressley, Levin, and Delaney (1982), Levin, and Levin (1990) and popular applications by Lorayne and Lucas (1974).

Of the several models that engage students in scientific inquiry, the work of the Biological Sciences Study Committee, led by Joseph Schwab (1965), was considered a Scientific Inquiry Model. The student is brought into scientific process and helped to collect and analyse data, check out hypotheses and theories, and reflect on the nature of knowledge construction. Developed for use with creativity groups in industrial settings, syntetics was adapted by William Gordon (1961) for use in elementary and secondary education.

Concept Attainment Model, built, around the studies of thinking conducted by Bruner, Goodnow, and Austin (1967), is an inductive model. Designed both to teach concepts and to help students become more effective at learning concepts, it provides an efficient method for presenting organised information from a wide range of topics to students at every stage of development. The model provides a way of delivering and classifying concepts and of training students to become more effective at developing concepts.

Related to Models of Teaching, this vital area of research the first study at Ph.D level was completed in 1983 by Chitriv at Nagpur. Now a large number of studies...
have been completed. These relate to studies where in Models of Teaching have been used for teaching and for training aspects.

Concept attainment is "the search for and listing of attributes that can be used to distinguish exemplars from non-exemplars of various categories". (Bruner, Goodnow and Austin, 1967: 233). Whereas concept formation, which is the basis of the inductive model requires the students to decide the basis on which they build categories. A quantitative investigation of Jean Piaget's original work on concept formation was conducted by Carpenter (1958) revealed that the type of reasoning shown by young children remains constant from situation to situation. Simpson (1975) made the objective of the study "to what extent can variables identified in studying concept attainment in a highly controlled laboratory situation have similar effect on concept attainment of social studies concept. He found that there was a higher score for subjects who had two levels of critical properties identified than subjects who had only one level of critical properties identified. This was found to have statistically significant difference. It was found to have proportionally higher score for subjects as instance presentation forms went from an example to description to a definition. The scores were found to have statistically significant differences in support of the hypothesis. While studying the relationship cognitive style and concept attainment efficiency Batchman (1975) found that verbal ability, cue relevance/Saliency and task complexity are important mediators in the relationship between FI and CA efficiency and success. The measures of CA strategy was found to be unrelated to FI difference.

Human being tend to deal with classes of things instead of individuals in order to make some sense out of their environment. By forming such classes cognitive strain is reduced as well as burden of memory. To form these classes or categories or sets, a person looks for cues, or for characteristics that save to distinguish things eligible
for membership in the set from those that are not eligible. The point is that these categorisations are inventions, and this is particularly true in a complex body of knowledge. (Rosskoft, 1985). Significant difference was found between instruction based on the examples only form, while studying the interactive effects of the personal traits of conceptual development and the different presentation forms of concept attainment by Lee (1984).

Training strategies in learning CAM in terms of teaching competency of student - teachers; in terms of understanding of the model; in terms of coaching through the model; in terms of reaction towards the model and in terms of willingness to implement the model was conducted by Bihari (1987) and found that training strategies namely peer feedback and practice in qudro, peer feedback and practice in pairs and demonstration followed by practice in qudro were equally effective for developing teaching competence. The reaction towards Concept Attainment Model of student teacher belonging to E1, E2 and E3 groups and the willingness to implement the model was studied by Passi, Singh and Sansanwal (1987) and found that the competency at the coaching stage of student-teachers belonging to E1, E2 and E3 groups differ significantly from one another.

Concept Attainment Model is found to be the most effective with respect to the achievement of students than the conventional method of teaching and there is a high correlation between the concept attainment scores and pre-requisite scores. The concept attainment scores related to objective under cognitive domain seem to be higher for the experimental group than those for the control group members. The reception and selection strategies of concept attainment are equally effective in terms of attainment of science concept. The studies conducted by Gangrade (1987), Sushama (1987), Varghese (1987), Resmi Agarwal (1988), Pani (1987), Renu Zacharia (1989), Jessey Joseph (1990) Susan Thomas (1995), Jayakumari (1996) and Sylasree (1996) revealed that the Concept Attainment
Model can develop the thinking abilities of students in a better way rather than the Conventional Method. Students can think independently in a meaningful, purposeful way and can generate hypotheses with the help of the teacher.

Inquiry is an attempt to find some answers or solution to a problem. The method aims in developing students inquiry skills of inferring predicting, recording data, controlling variables, experimenting etc. The students develop critical thinking. They learn to gather and analyse data. They attain the capacity to draw conclusion and to hypothesise.

Designed to teach students to engage in causal reasoning and to become more fluent and precise in asking questions, the Inquiry Training Model was first formulated by Richard Suchman (1962). Suchman Inquiry model differs from other Inquiry Models primarily in the way a problem is identified and data are gathered. Inquiry training begins by presenting a discrepant event and the students are naturally motivated to solve the problem. It is basically a question answer approach. It is both inductive and deductive. There is no competition among children, no extrinsic rewards no stress on grades.

Inquiry training is designed to bring students directly into the scientific process through exercises that compress the scientific process into small periods of time. Schlenker (1976) reported that inquiry training resulted in increased understanding of science, productivity in creative thinking, and skills for obtaining and analysing information. He reported that it was not more effective than conventional methods of teaching in the acquisition of information, but that it was as efficient as recitation or lectures accompanied by laboratory experiences. Ivany (1969) and Collins (1969) reported that the method works best when confrontation are strong, arousing genuine puzzlement, when the materials the students use to explore the topics under consideration are especially instructional. Both elementary and secondary students can profit from the model (Voss, 1982). In an intriguing study
Elefant (1980) successfully carried out the model with deaf children, which suggests that the method can be powerful with students who have severe sensory handicaps.

Inquiry Training is successful in promoting cognitive development, increasing content achievement, enhancing inquiry skills achievement and producing gains in mental ability scores. Wilson's process model of inquiry is the one which identifies several sets of processes as key elements of Inquiry. Generating tentative ideas serve to direct the activity of both empirical and conceptual inquiry. Inquiry centered teaching with material objects helps in the development of conservation reasoning in children. Studies in support of the above conclusion are that of Marck (1978), Wilson (1976) and Renner Stafford (1970).

Creativity is the most important instinct of child. To create something is the inborn instinct among children. The educational system provides no direction to creative domain of child and so many talents are left in beginning stage itself. They do not find proper condition of growth. Maria's study (1981) on the use of Inquiry Instruction to foster creativity clearly states the superiority of Inquiry Training. Studies conducted by Indira Devi (1982), Awodi (1984), Pandey (1986) Lekha (1989), Jaysree (1990), Gopakumar (1995) and Dais George (1995) revealed the same result of the superiority of inquiry based instruction.

The Advance Organizer Model formulated by David Ausubel (1963) is a deductive Information processing Model designed to teach interrelated bodies of content. In deductive models the broader or more inclusive ideas are presented first and are followed by less inclusive ideas. In addition, the Ausubel Model organising statement called an Advance Organizer presented at the beginning of the lesson acts as a connection between the material to be learned and the learner’s cognitive structure. The Advance organizer acts as a cognitive road map, guiding the student over the new content to be learned. The organisers enhanced the learning of the material even for the students with poor verbal ability. Knowledge of the first passage constituted significant limiting conditions in learning
Fitzgerald (1962) studied the effect of an Advance Organiser, antecedent learning and general background knowledge on the learning and retention of two familiar sequential passages about Endocrinology. Ausubel and Yousef (1964) suggested that previously learned relevant background knowledge significantly facilitated the learning and retention of the first two parallely related, unfamiliar learning passages when the influence of verbal ability was controlled.

Organisers are effective across ages, being somewhat more effective for students at the stage of concrete operations and across curriculum areas. Illustrations add to the effectiveness of organisers, and the impact is increased when they lead to activities and generalisations. Aman (1982) investigated the effects of the use of an Advance Organiser on transfer in Programmed Instruction situation and was found that an Advance Organiser in combination with LAP was more effective in decreasing magnitude of error on post-test scores than was the LAP alone.

While organisers affect several kinds of outcomes, recall of facts and formulae is most affected. Stone’s (1983) analysis supports this idea.

While comparing the CAM and AOM with traditional methods in terms of performance on the concept knowledge test, Chitriv (1983) found that the AOM and CAM were significantly superior to the traditional method, for teaching mathematical concepts to XIth grade students. The Advance Organiser Model and operant conditioning model were significantly superior to the traditional method in terms of achievement of B.Ed students in educational psychology (Buddisagar, 1987).

Again Passi Sansanwal, Ajith Singh (1988) conducted a study on the effectiveness of different training strategies for AOM ans JIM in terms of understanding competence reactions and pupil liking. They found that the training in the Models of Teaching was effective in bringing about positive changes in student teachers with regard
to specific instructional effects. They firmly expressed that the use of these models in the colleges of education is practical.


"The Personal Models of learning begins from the perspective of selfhood of the individual. They attempt to shape education so that we come to understand ourselves better, takes responsibility for our education, and learn to reach beyond our current development to become stronger, more sensitive, and more creative in our search for high quality lives". (Joyce and weil, 1997: 18) The model of Non directive teaching is used in several ways. It is used as a basic model for the operation of the entire educational programmes (Neill, 1960) and with all types of students and across all subjects and teaching roles. Although designed to promote selfunderstanding and independence, it has fared well as a contributor to a wide range of academic objectives. (Aspy and Roebuck, 1973)

Abraham Maslow (1962) and Carl Rogers (1961) developed formulations of personal growth and functioning that have guided attempts since then to understand and deal with individual differences in response to the physical and social environment. Rather than concentrating on intellectual aptitude and development, their theories focussed on individuals view of self or self concepts.

The Social Models of teaching are constructed to take advantage of the phenomenon of synergy that is the collective energy evolved as a result of working
together. “Class room management is a matter of developing co-operative relationships in the class room” (Joyce and Weil 1997:12). In recent years there has been a great deal of development work on co-operative learning, and great progress has been made in developing strategies that help students work effectively together. The contributions of the three teams—led respectively by Roger and David Johnson, Robert Slavin and Shlomo Sharan, (1990) have been particularly notable, but the entire cooperative learning community has been active in exchanging information and techniques in conducting and analysing research. The result is a large number of effective means for organising students to work together.

Group investigation is the direct route to the development of the community of learners. John Dewey (1916) developed the idea—extended and refined by a great many teachers and theorists and shaped into a powerful definition by Herbart Thelan (1960) that education in a democratic society should teach the democratic process directly. Group investigation has been used in all subject areas. With children of all ages, and even as the core social model for entire schools. (Chamberlin and Chamberlin, 1943)

Roleplaying leads students to understand social behaviours their role in social interactions and ways of solving problems more effectively. Designed by Fannie and George Shaftel (1982) specifically to help students study their social values and reflect on them, role playing also helps students collect and organise information about social issues, develop empathy with others and attempt to improve their social skills. The Jurisprudential Model is designed to study the social issues at community, state national and international levels and made them available to students. Created especially for secondary students in social studies, the model brings the case study method, reminiscent of legal education, to the process of schooling (Shaver 1995).
Behaviour modification Models were evolved from attempts to develop efficient systems for sequencing learning tasks and shaping behaviour by manipulating reinforcement. Exponents of reinforcement theory, such as Skinner (1957) have developed these models and operant conditioning as their central mechanism. Among the various models were the Programmed Instruction Model, Managing Behaviour Model, Relaxation Model, Anxiety Reduction Model, Assertive Training Model and Simulation Model.

The most common application of behavioural systemstheory for academic goals takes the form of what is called Mastery Learning (Bloom, 1971) Instructional system based on this model have been used to provide instruction to students of all ages in areas ranging from the basic skills to highly complex material in the academic disciplines (Shooja 1996). Programmed Instruction is based on the theory of operant conditioning as is the operant conditioning model which has been used in developing programmed learning material which has been compared with conventional methods of teaching (Shah, 1964), Desai (1966), Sharma (1966), Dwivedi (1983), Kalacherry (1987) and Ajith R.Pillai (1995). All these studies reported that programmed learning material was significantly superior to conventional method of teaching in terms of achievement.

All these studies reveals that there is no one method of teaching which is the best method. Instruction in science can be varied using methods of group work, projects, supervised study and research, demonstrations, case studies, field trips etc. Some topics or problems may be taught more economically through the use of one method than the other. Each science teacher should explore the use of the best suitable method for different topics in different classes. Through teaching experience the science teacher will learn which methods are most productive in promoting the learning of science in various classes.
On the basis of the studies presented in this category, it may be said that the conventional method of teaching different subjects at various levels was found to be less effective than various innovative teaching patterns like Programmed Instruction, Instructional Strategies and Models of Teaching in terms of achievements of students. The thorough review of the reported studies of related literature showed that though very serious work has been done in instructional theory, leading to Models of Teaching, empirical studies with special reference to specific subjects as well as areas are not very many. Even among them, one relating to Chemistry teaching is found to be none. Hence this survey shows the relevance of the projects taken by the investigator. The review of related studies throw light on the nature on work done in this area and help the investigator in designing the study, in formulating the objectives, selecting methods, tools and techniques of the present study.