CHAPTER – I

INTRODUCTION

Teaching has been looked upon as a process of imparting knowledge and skills to the learner by simplifying environment for him and at the same time strengthen him with knowledge and attitudes to meet the environment with its growing complexities. It is often thought of as something that comes rather naturally to people who know their subject. In general, it is thought that it is a simple process that produces simple outcomes. But teaching is an intriguing, important and complex process. It takes place in a complicated social institution, which is filled with diverse people.

Yoakam and Simpson (1934) have brought out the idea of adjustment in teaching in this statement “Teaching is the means whereby society trains the young ones in the world they live”. In primitive societies, this adjustment means conformity with things as they are. In more advanced civilizations such as ours, effort is made to make advancement in improvement of conditions of life. Teaching is a dynamic process. It is a fluid interplay of events. One cannot just know
the subject and teach it; because the subject themselves are ever-changing. Mursell (1946) in his book ‘SUCCESSFUL TEACHING’ says that teaching is not so much the direction or the guidance of learning as the organization of learning which means all elements of the teaching learning situation have to be brought into relationship and built into an intelligible whole. Success had been measures in terms of student’s ability to answer teacher’s question in the past but the concept of teaching is not so simple now. Now the teacher must know how to control five processes of teaching; firstly making and using knowledge, secondly, shaping the school, thirdly teaching with strategy, fourthly creating interpersonal climates and fifth and lastly controlling a teaching personality.

Briner (1966) also emphasized four major features of theory of instruction in effective teaching.

(i) Predisposition toward learning.
(ii) Structured body of knowledge.
(iii) Sequences of material to be learnt, and
(iv) The nature of pacing of reward and punishment.

It means that a theory of instruction in teaching is concerned with how what one wishes to teach, can best be learnt, with improving rather than describing learning. So, emphasis must be on giving rich learning experiences so as to motivate the learners in the teaching learning process. In the present problem also the investigator wishes to look upon the fact how teaching learning can be imparted in a learner friendly way.
CONCEPT AND NATURE OF TEACHING:

In absence of empirical data, the concept of teaching was governed by what philosophers said about it. The concept of teaching drew its primary data with the development of learning psychology. With growing time, the experience of teachers was another source of its data. From casual observation of teaching, we came to the conclusion that actual class room teaching does not confirm to the methods of teaching described in text books. This conclusion has been sustained by subsequent observations (Smith, 1963). Actual teaching is so vivid, so complex, so fluid as almost to defy any description whatsoever, and it certainly does not respond to the concept of method set forth in the treatise on the subject. The inadequacy of the concept of teaching lack empirical base and therefore has been one of the parent red block in the way of improving teaching effectiveness (Smith, 1977).

METHODS BASED TEACHING:

Teaching methods inevitable constitute significant aspect of the human effort to education. These are the patterns of teacher behavior that recurrent, applicable to various subject matters, characteristics of more than one teacher and relevant to learning and may be considered a sub-category of educational methods which also include instructional devices such as teaching machines, conventional and programmed text books, simulations, films and others such as inductive and deductive method, heuristic method, lecture method, discussion method, discovery method, problem solving method and project method etc.

The origin of methodology in education can be traced to the ideas of Rousseau, who himself was influenced by Locke and other. Earlier writers like Comenius, rebelled against the formal education of their
days and suggested better principles of teaching but without any tangible results because of the turmoil of the times. In the eighteenth century, Rousseau provided some of the ideas for reforms in teaching which other developed and put into practice. The most important of these reformers was Pestalozzi, who accomplished his great work in Switzerland between 1800 and 1825. Pestalozzi attempted to reduce the educational process to an organized routine, based on the natural development of the child. Although not original or very efficient his work marks the introduction of modern pedagogy and the beginning of the modern methods in elementary training. Pestalozzian ideas spread rapidly throughout Europe and the United States but had little practical influence upon methods of teaching in the secondary schools.

Frobel, Herbart and others succeeded, Pestalozzi. Herbart emphasized educational development from experience and from the environment, as contrasted with Pestalozzi’s emphasis on mental development from within and according to organic law.

Thus, although Herbart recognized the need for adopting instruction to fit the capacities of a child, his chief concern was with method and with the work of the teacher. Herbart undertook to show that education consisted in the building up of an “a perceptive mass” in ideas rather than in the development of the mental faculties.

By 1910, Herbartianism as a system of education was generally criticized. The emphasis upon the teacher and upon formal procedure, especially, was opposed. Modern educational theory and practice have been grown largely out of the work of Pestalozzi, Frobel and Herbart. The new philosophy, however, is based upon a new psychology and upon new scientific procedure. It emphasizes the pupil and upon modern scientific procedure. It emphasizes the pupil, at least in theory, it regards
learning as an active process, it considers the interests of the pupils individually and collectively and it lays stress on education as being constant process of reorganizing and reconstructing experience.

**RECENT DEVELOPMENTS IN METHODS OF TEACHING:**

Recent work of Piaget, Bruner and Ausubel in the field of learning is developing a number of learning theories. Gage (1963) explains that relative neglect of theories of teaching in the minds of researchers is due to the reason that if there is a theory of learning, then the teacher can act upon that theory for teaching in the classroom. Smith (1961) points out that there is a difference between the process of teaching and learning. In the light of this theory there is need for separate theory of teaching with a view to maximize learning.

Bruner (1966) theory of teaching can be derived from theory of learning and theory of development. Theories of learning are descriptive, i.e., describe the process of learning whereas theory of teaching is prescriptive in the sense that is sets forth rules concerning the most effective ways of helping children to achieve knowledge and skills. Theory of teaching needs congruency with those of theories of learning and development to which it subscribe.

**MODELS BASED TEACHING:**

From the dictionary meaning, the model is a pattern of something to be made or reproduced and means of transferring a relationship or process from its actual setting to one in which it can be more conveniently studied. In the point of view of teaching, a model of teaching is a plan or pattern that can be used to shape curricula, to design instructional materials and to guide instruction in the classroom.
and other settings. The most important aim of any model of teaching is to improve the instructional effectiveness in an interactive atmosphere and to improve or shape the curriculum.

Joyce and Weil (1980) organized the alternative models of teaching into four families: these are information processing, social interaction, personal and behavior modification. They stress that the different instructional goals would be realized by putting these models of teaching into action.

(A) INFORMATION PROCESSING FAMILY OF MODELS OF TEACHING:

The models of teaching of this family are concerned with the organization, presentation of verbal and non-verbal symbols in a way that helps in the formation of concept and solution problem and development of social relationship and integrated personality. Thus these models are concerned with the productive thinking and development of general intellectual ability. The important models of this family are as follows:

i. Inductive thinking model of Hilda Taba:

It proposes to process the information through inductive process.

ii. Scientific inquiry model of J. Schwab:

It is designed to teach the method employed by the subject for solving scientific and social problems.

iii. Concept Attainment model of J. Bruner:

It proposes to develop concept inductive reasoning i.e., developing a concept after presenting its examples and non-examples.
iv. Advance Organizer Model of David Ausubel:
   It proposes to increase the capacity of learning to absorb and relate bodies of knowledge.

v. Cognitive Growth Model of Jean Piaget:
   It has been designed to increase general intellectual ability especially logical reasoning.

vi. Memory Model of Henry Lorayne:
   It is designed to increase the capacity to memorize concepts, facts etc.

(B) PERSONAL FAMILY OF MODELS OF TEACHING:
   The models of this family are intended to develop the unique personality of the learner. These models pay more attention to the emotional life of the person and also focus on helping individual to develop a productive relationship with their environment. Some of the important models of this family are as follows:

i. Non – Directive Teaching Model of Carl Rogers:
   It aims at the development of the personal self in self-awareness, autonomy and self-concept.

ii. Synetics Model of William Gorden:
   It is designed to develop creativity and creative problem solving in the learner.

iii. Classroom meeting model of William Glaser:
   It aims at the development of a sense of responsibility and self – confidence in one’s social group.
(C) SOCIAL FAMILY OF MODELS OF TEACHING:

The models of this family are concerned with the social relationship of the individual with others in the society. These models aim at the development of social relationship, democratic process and work productivity in the society. This is not to say however that these models restrict themselves to the development of social relationship. They are also concerned with development of mind and the learning academic subjects. Some of the important models of this family are as follows:

i. Group Investigation Model of Herbert Thelen and John Dewey:

It aims at the development of skills for participation in democratic social processes through interaction skills and inquiry skills.

ii. Role playing model of Shaftel and Shaftel:

It aims at motivating students to inquire into different personal and social values.

iii. Social simulation model of Seren Boocock and Harold Guitzknow:

It is designed to help student to experience various social processes and to examine their own reaction to them and also acquire concept and decision making skills.

(D) BEHAVIOURAL FAMILY OF MODELS OF TEACHING:

The main thrust of these models is modification of the visible or the overt behaviour of the learner rather the underlying psychological structure and unobservable behaviour. The main psychological bases of these models are stimulus control and reinforcement as put forward in B.F. Skinner’s theory of operant conditioning and Bandura’s theory of social learning. The common characteristics are that they breakdown the
learning task into series of small sequences of behaviour. Each behaviour is so designed that success is ensured; the learner actively responds to the problematic situation and gets reinforcement and feedback. Some of the important models of this family are as follows:

i. **Contingency Management Model of B.F. Skinner:**
   It proposes to teach facts, concepts and skills.

ii. **Self-Control Model of B.F. Skinner:**
   It is designed to develop social behaviour and social skills.

iii. **Stress Reduction model of Rimm and Masters:**
   It aims at reduction of stress and anxiety in social situation and their substitution by relaxation.

iv. **Desensitization Model of Walpe:**
   It is designed to reduce anxiety through pairing deep muscle relaxation with imaginative scenes that the student had said cause him or her to feel tense.

Each model has its unique features and some important components.

**COMPONENTS OF MODELS OF TEACHING:**
The model of teaching consists of the following components:

**Syntax:**
It describes the phases of the model. Each model has different strategies.

**Social System:**
It describes the students and teachers role and relationship and the kind of norms that are encouraged.

**Principles of Reaction:**
It explains the procedure in which the teacher deals with the reactions of the student’s support system.
It deals with the use of other teaching aids, human skills and capacities and technical facilities.

**Instructional and Nurturing Effect:**

It describes the direct and implicit results of instructions.

**Application:**

It deals with the further applicability of the model for different curriculum and classes.

Teaching models are being used in education widely these days. The following factors are responsible for the ever growing popularity of models of teaching:

(i) It has tremendous potential to meet most of educational needs of the learners.

(ii) It is learner based in nature and can meet the individual needs of learners.

(iii) It has a time sharing facility which makes it possible to provide instruction to a large number of learners simultaneously.

(iv) It has a resource sharing facility which enables a learner to make use of resources available with another learner.

(v) It has flexibility in designing and instructional strategy suited to the needs of a learner. One can summarize some more advantages of MODELS OF TEACHING as:

- It enhances the activity among the learners. Learning with the aid of MODELS OF TEACHING makes it easier, quicker and more effective.
- It enhances motivation which is one of the most important features of modern learning and teaching. Effective motivation
is possible through careful study of motives which are to be used at different steps of teaching and learning.

- It enhances creativity.
- It enhances interest in the teaching learning process. Suitably chosen models of teaching facilitate healthy classroom interaction of teacher and taught. Science remains as one of the complex subjects for students.

Recently various models of teaching are being used in teaching particularly in science teaching. Mastery learning model and Concept attainment models are most widely used. So, the present study was undertaken to see the effect of Master Learning Model (MLM) and Concept Attainment Model (CAM) on achievement of students towards some concepts of science.

1- MASTERY LEARNING MODEL (MLM)

In this approach the amount of material learned is the ‘constant’ and time is the major variable. It has been currently creating much controversy and excitement in education circle. The controversy centers on mastery learning’s views, about human potential to learn and to teach, and the excitement around mastery learning’s classroom practice.

(A) HISTORICAL PERSPECTIVE:

Mastery Learning Instruction Strategies (MLIS) is an explicit philosophical perspective about teaching and learning. This perspective asserts that under appropriate instructional conditions virtually all students can learn well what they are taught. In other words all students can “master” the subject material.
The idea of ML was generated in 1920 is not new. However, early attempts of using this concept can be traced to programs developed by C. Washbume (1922) and H.C. Morrison (1926). Recent work has sharpened this idea and contemporary instructional technology has made it more feasible. The said approaches shared some common major features of ML and created ground for development of particular objectives formed the base for well defined, and systematically ordered, learning units. Mastery of a unit regardless of the time spent, was determined by an ungraded diagnostic progress test before the student could progress to the next unit, and to supplement original instruction with appropriate learning correctives, so that student could complete his unit. Finally, time was used as a variable in individualizing instruction and thereby in fostering student learning mastery. Under Washbume’s Winnetka Plan student learning was self-paced. Each student was allowed, all the time, he needed to master a unit. Under Morrison’s method each student was allowed the learning time his teacher required to bring all (or almost all) students to unit mastery. These characteristics are, as suggested, similar to the current scheme of mastery learning. While Morrison’s method was popular in the thirties, eventually the idea of ML disappeared due to lack of the technology required to sustain a successful strategy i.e. Programmed Instruction and Mastery Learning (PI & ML).

A basic idea underlying PI was that the learning of any behaviour, no matter how complex, rested upon the learning of a sequence of less complex component behaviour (Skinner, 1954). By breaking a complex behaviour down into a chain of component behaviours’, and ensuring students of each link in the chain, it would be possible for any student to master mind the most complex skills.
Recent discussion on ML, however seems to go beyond these steps suggested by Washbume (1922), Morrison (1926), Skinner (1954) and refers to Carroll’s (1963) ‘Model of School Learning’. Carroll’s Model was a conceptual paradigm which outlined the major factors influencing student success in school learning, and indicated how these factors interacted.

(B) BLOOM PERIOD (1968-1971):

Since this period was dominated by the writings of Bloom, it was called Bloom period.

As a result of Carroll’s model, investigators have examined various instructional methods and techniques to determine which factors most affect the quality of instruction. It was perhaps Bloom who first provided the theoretical and practical basis for such technology (Anderson & Block, 1985). Bloom operationalized Carroll’s conceptual model into an instructional system referred to as ‘Mastery Learning’ which has been associated with increased student achievement. Bloom suggested that ‘cues-participation-reinforcement’, are essential components of a quality instructional system, with a feedback (FB) and corrective procedures being used liberally to ensure that each student receives optimal instruction. The teaching-learning strategy Bloom outlined to include FB and corrective procedures was labeled: ‘Learning for Mastery’ (Bloom, 1968) and later shortened simply ‘Mastery Learning’ (ML).

(C) POST BLOOM PERIOD (1971 - onwards):

This period, dominated by the writings of Bloom’s students and colleagues, was called ‘Post Bloom Period’ (Anderson & Block- 1985), spanned the time from 1971 to present.
While Bloom turned his attention to developing a theory, a number of Bloom’s students and colleagues devoted their attention to developing the practice. At first the efforts of some of these individuals were concentrated on applying the theory and related practices to the improvement of classroom and then school wide practices. As a consequence the efforts of a number of individuals shifted to the improvement of system wide practices.

Because the ML is rooted in Carroll’s Model of school learning, it is useful to have a look at this approach. Carroll formulated the model on the following assumptions:

(i) The model assumes that the work of school can be broken down to a series of discrete learning tasks.

(ii) Model applies to only one learning task at a time. But it should be possible to describe a student’s success in learning a series of tasks (all the work of a certain school year) by summarizing the result of applying the model to each component task.

(iii) It is not intended (to be applied) to goals of school that have to do with attitudes and dispositions (social and emotional goals of schooling). While Carroll acknowledges that learning tasks may play a role in support of attitude development. The acquisition of attitudes is postulated to follow a direct paradigm from that involved in learning task (Carroll, 1963).

(iv) According to Carroll the model should not be confused with what is ordinarily called ‘learning theory’. His model is intended to a ‘description of the economics of the school learning process’ (Carroll, 1963) rather than as an exact scientific analysis of the essential conditions for and process of learning itself.
(D) FIVE VARIABLES OF CARROLL’S MODEL:

Carroll’s model contains five elements. Three of which have arisen from external conditions. Each three of these determine time needed to learn a task, and the last two determine time actually spent in learning.

(1) Aptitude, that is the amount of time needed to learn the task under optimal instructional conditions, (2) ability to understand instruction related to his general intelligence and verbal ability, (3) Perseverance, that is the amount of time the learner is willing to engage actively in learning, (4) opportunity, that is the time allowed for learning and (5) quality of instruction judged by the degree to which it is optimal for every pupil.

Carroll’s definition of aptitude as the amount of time needed to learn a task at a given criterion level was his most significant contribution. Prior to him aptitude was defined in terms of the level of performance. He stressed that a student’s aptitude has traditionally, been seen as an index of the level to which a child could learn in a given amount of time. From this perspective, children tend to be viewed as either good or poor learners. The alternative perspective suggested by Carroll was to view aptitude as an index of amount of time required by a child to learn the subject to a given level. Thus, instead of being aptitude as a measure of ability to learn a particular subject or of specific learning potential, Carroll suggested that it could be viewed as a measure of learning rate. From this perspective children are seen as being fast or slow learners, rather than as good or poor learners.

In its simplest form his model proposed that if student was allowed the time needed to learn some level, and he actually spent the required learning time, then he could be expected to attain the level. On
the other hand, if sufficient time was not allowed, or if the child did not spend the time required, then the degree to which he or she would learn could be expressed as:

\[ \text{Degree of School Learning} = f \left( \frac{\text{Time Spent}}{\text{Time needed}} \right) \]

That is the degree of school learning would be a function of the time the child actually spent on the learning, relative to the time he or she needed to spend. Therefore, the numerator of this ratio can be established by a teacher (allocating little or no time) for a student (who may be unwilling to spend any time attempting the tasks), or by interaction of student aptitude and ability to understand instruction with the quality of instruction. The denominator of the fraction is actual time needed to learn after adjustment for quality of instruction and ability to understand instruction. Aptitude is also one of the three possible values of the numerator. Both teacher and student can influence the size of the denominator.

The model uses only the aforesaid five variables to explain the degree of school learning of particular task. According to Carroll the specified five variables influence the components of this model. He believed that the time spent and time needed was influenced by both, the characteristics of the individual learner and the characteristics of the instruction.

According to Carroll all variables that directly influence the learning of children in school could be defined in terms of time. The reason was to capitalize on the advantages of a scale with a meaningful zero point and equal units measurement.

The full Carroll model conceived of school learning as consisting of series of distinct learning tasks. In each task the student proceeded
from ignorance to some specified fact or concept to knowledge or understanding of it, or from incapability of performing some act to capability of performing it (Carroll, 1963).

(E) CARROLL’S MODEL AS A BASIS FOR MASTERY LEARNING:

Building upon Carroll’s work Benjamin S. Bloom (1968) took up the job of transforming this conceptual model of school learning into working model for classroom instruction. If aptitudes were predictive of the rate at which and not necessarily the level to which a student could learn a given task, it should have been possible to fix the degree of learning expected of students at some master level and so systematically manipulate the relevant instructional variables in Carroll’s model such that all (or almost all) students attain it. Bloom argued that if students were normally distributed with respect to aptitude for a subject and if they were provided with uniform instruction in terms of quality and learning time, achievement at the completion would be normally distributed. Further the relationship between aptitude and achievement would be high.

However, if students were normally distributed on aptitude but each learner received optimal quality of instruction and the learning required, then a majority of students could be expected to attain mastery. There would be little or no relationship between aptitude and achievement.

According to Bloom (1968) the normal grading curve has been used for so long that educators have come to believe it. The normal curve is not sacred. It describes the outcome of random process. Since education is a purposeful activity in which we seek to have students
learn what we teach, the achievement distribution should be very different from the normal curve, if our instruction is effective. In fact our educational efforts may be said to be unsuccessful to the extent that student achievement is normally distributed. So, the fundamental task of education is to develop strategies which will take into account individual differences in such a way as to promote rather than inhibit the fullest development of the individual.

(F) BLOOM STRATEGY OF MASTERY LEARNING:

MLS is derived primarily from the work of Carroll (1963). Bloom’s main concern is to focus on the major variables in a model of school learning, and to suggest how these variables might be used in a strategy for ML.

(1) Aptitude for particular kind of learning: According to Carroll (1963) aptitude is the amount of time required by the learner to attain mastery of a learning task. Bloom (1964) believes that aptitudes for particular learning tasks are not completely stable and that they may be modified by appropriate environmental conditions or home and school learning experiences.

(2) Quality of Instruction: Carroll (1963) believes that individual student may need very different types and qualities of instruction to learn the same content and instructional objectives to mastery levels. He defines the quality of instruction in terms of the degree to which the presentation, explanation and ordering of elements of the learning task approach the optimum for a given learner.

Bloom observed that if every student had a well-trained tutor, then most of them would be able to master a particular subject. The main point to be stressed is that quality of instruction must be developed
with respect to the needs and characteristics of individual learners, rather than group of learners.

Ability to understand instruction can be defined as the ability of the learner to understand the nature of the task he is to learn and the procedures he is to follow in its learning. In our school, ability to understand instruction is determined by learner’s ‘verbal ability’ and ‘reading comprehension’. These two features are highly correlated with achievement. Therefore, immediate modification needed is in dealing with ability to understand instruction. There are many instructional strategies which teachers can use to fit their instruction to the differing needs of all their students. They are: (i) small group study session, (two/three students), (ii) Tutorial help, (iii) alternative textbook examinations, (iv) workbook and programmed instruction on unit and (v) audio-visual methods and academic games. So the goal should be not only to help the student over specific learning difficulties, but also to enable him to become more independent in his learning and to help him identify the alternative ways by which he can comprehend new ideas. It is learning, that is important and alternatives exist to enable all or almost all the students to learn the subject to a high level.

(3) Perseverance: Carroll (1963) defines perseverance as the time the learner is willing to spend in learning. Bloom believes that perseverance is not fixed. It can be increased by increasing the frequency of reward and evidence of learning success. Furthermore, the need for performance can be decreased by high quality of instruction.

(4) Time allowed for learning: According to Carroll (1963) the time spent on learning is directly proportional to mastery. His basic assumption is that aptitude determines the rate of learning and that most
if not all students can achieve mastery, if they devote the amount of time needed to learn. This implies that the student must be allowed sufficient time for learning. The learning time needed will be affected by his aptitudes, his ability to understand the instruction, and the quality of instruction. If students use of time and instruction become more effective, it is likely that most students will need less time to master a subject, and the ratio of time required by the slower learners to that needed by the faster learners may be reduced from about 6 to 1 or perhaps 3 to 1.

The MLS, Bloom proposed were designed to use in the classroom where the time allowed for learning is relatively fixed and mastery was defined in terms of specific set of major objectives the student was expected to exhibit by a subject completion.

Bloom’s approach represented a great advance over previous strategies in two important respects. First feedback instruments were much improved with structured description of blue print from which the diagnostic instruments could be built. The feedback instrument improvement was also attributable to a major evaluations breakthrough called formative evaluation (Airasian, 1969). Second, this strategy employed a greater variety of instructional correctiveness than the previous approaches.

The teaching learning strategy Bloom outlined to include the feedback and corrective procedures was labeled ‘learning for mastery’ (Bloom, 1968) and later shortened to simply ‘mastery learning’. Unlike other individualized instructional strategies under mastery, it is the teaching rather than the students, who determines the pacing of instruction. As conceptualized by Bloom (1976), and others ML entail the following:
(i) Material to be learned over a time period is divided into smaller units and performance criteria is established, (ii) Following instruction on each learning unit a test is administered, the result of which periodically fed back, to teacher and students regarding mastery of unit and necessary corrective strategies, (iii) The teacher provides corrective feedback until the student achieves mastery on the learning unit, (iv) the student then progresses to the next skill in the learning hierarchy, (v) through this process of formative testing combined with systematic correction of individual learning difficulties, each student receives appropriate amount of allocated quality instructional time and proportion of engaged learning time (Fuchs et al., 1986). Bloom (1976) reasoned that under these conditions virtually all students could achieve mastery of school curricula.

2. CONCEPT ATTAINMENT MODEL:

According to instructional design research as reported by Tennyson and Okay Choon Park (1980), a concept is assumed to be a set of specific objects, symbols or events which share common characteristics and can be referenced by a particular name or symbol. Concept Learning is thus regarded as the identification of concept attributes which can be generalized to newly encountered examples and discriminate examples from non-examples.

Concepts are basic elements of thought. A concept is not observable. It cannot be an observable stimulus or set of objects, or an observable response. A concept is an abstraction from the world of sense, and it is this abstractness which gives a concept its great utility in thought, while making definition and measurement so difficult. The best procedure today is to treat the concept as hypothetical construct;
specifically an ability to construct, standard abstractions are association with words or other symbols but the symbol is not the concept. Each individual learns each concept for himself but if he communicates with and learns from other people, the cognitive structure through which he views the world will be the standard concepts of the culture.

Concept is the cognitive structure which each individual builds for himself in his continues effort to impose meaning upon the chaotic world of sense. Second, concept is a piece of culture, handed down, like the rest of the culture. A concept then is an abstraction for classification, communication and problem solving according to the standard of culture. In concept learning an individual can discriminate and describe characteristics, use the word, and apply the knowledge.

(A) THE STRUCTURE OF CONCEPTS:

There are four varieties of concepts as under (Johnson, 1972) namely Class Concept, Dimensional Concept, Explanatory/Principle Concept, and Singular Concept.

1.Class Concept: In this variety knowledge is organized. In this context, class and category are synonyms. Classes are discrete structure that differ quantitatively one from another. Most classes are multidimensional characterized by two or more attributes. Classes can be defined by identifying the instances including in them, and by describing the attributes of the class. Extensional significance denotes member of class, whereas Intentional significance consists of properties that defines the class and characterize its member. In different contexts these properties are called attributes, dimensions and qualities. Class concept has three variations:

i. Conjunctive Concept: Relevant dimension, Irrelevant Dimension.
(ii) **Disjunctive Concept**: Defined by either/or attributes.

(iii) **Relational Concept**: Relation between feature rather than presence of feature.

(2) **Dimensional Concept**: They have much in common with class concept but dimensions are continuous. While classes are discrete, as “very bad”, “Very small” (small and bad are class). Some of these dimensional concepts are based on salient perceptual qualities such as size, colour and are therefore relatively easy to learn. Those based on more abstract properties like “acceleration” are harder to learn.

(3) **Explanatory/Principle Concepts**: A principle is an abstraction of a higher order of complexity than a concept since it states a relation between concepts either dimensional or class concept. Principles are more important than concepts. Concepts help us to refer to events. Principles help us to understand and predict events.

(4) **Singular concepts**: A singular term, such as proper name or a demonstrative pronoun, is a term that signifies exactly one individual thing.

(B) **DEVELOPMENT OF CAM (Concept Attainment Model)**

In concept attainment the concept already exists. The concept attainment strategies (CAS) are concerned with two separate but related ideas: The nature of concepts themselves and the thinking processes used by individual to learn concept.

According to Bruner, the act of ‘concept formation’ and the act of ‘concept attainment’ are two components of the activity of categorizing but the distinction between them is important because,
(i) The purpose of and emphasis on these two forms of categorizing behaviour are different.

(ii) The steps of the two thinking processes are not the same and 

(iii) The two mental processes require different teaching processes.

What is common to both the processes is their reliance on the same interpretation of the nature of concepts.

(C) ESSENTIAL ELEMENTS OF CONCEPT ATTAINMENT:

Bruner et.al. (1967) recognized the following five essential elements in the process of concept attainment.

(i) There is an array of instances to be tested consisting of exemplars and non-exemplars of the concept. The instances may be characterized in terms of their attributes and attribute values.

(ii) A tentative decision (or prediction) is usually made about the nature of the concept for each instance encountered by the individual.

(iii) Validation of the prediction or decision comes when the individual learns the correctness of the prediction.

(iv) The validation procedure provides potential information to the individual by limiting the number of attribute values that are predictive of the concept to be attained.

(v) A pattern of decisions referred to as a strategy evolves as the individual proceeds test various instances. The choice of strategy is determined by three main objectives:

(a) to maximize the information gained in each validation.

(b) to reduce mental strain by operating within the limits of one’s own capacity (different strategies impose varying demands on the individual) and
(c) to regulate one’s behaviour according to the risks, penalties, reward and time limit etc. of the situation.

Consequences follow any decision about a particular instance.

(D) USE OF CAM IN EDUCATION:

The uses of the concept attainment model are:
1. To teach students about the nature of concept, to help them understand how objects are distinguished by attributes and placed in categories.
2. To teach students to be more effective in attaining concept (finding out categories which others use to organize the environment) and forming concept developing new categories.
3. To teach specific concept.
   Thus observing the usefulness of these models particularly in science education, these models were chosen up for the study.

MODELS OF TEACHING AND INDIVIDUAL DIFFERENCES:

Models of teaching are appropriate to deal with Individual Differences because of the following:

These organize instruction for the development of cognitive process:
Instructions provided through models of teaching aim at the development of student’s cognitive process beyond the attainment of information alone.

These use existing cognitive level as base: Before using a particular model of teaching the reasoning level of the students is observed to identify which operations /activities they can perform and which they cannot.
These strengthen memory: Learning or problem solving often requires retaining fairly large amounts of information in the memory system. Use of models of teaching makes learners active in generating concepts themselves and thus the information acquired is registered well in the memory.

These formulate level specific instructional strategy: Instructional strategy which is the best for one group is not necessarily the best for another. Gifted students as compared to average and low ability students require intellectually more demanding (higher order thinking) learning situations. Enriched learning experiences can be provided to them. On the other hand, for average and low ability groups, clearly explicit, more direct and sequentially structured instructions are required. In a heterogeneous classroom one can organize instructions based on ability grouping using models of teaching where students are grouped according to the level of their ability and instruction is modified to suit their level of ability.

These provide instructions to overcome learning disability: Use of tutoring and remedial instructional materials, learners with learning disability can be taught to match full to their potentialities.

These use individual meeting: Models of Teaching as a modification may use individual meetings when appropriate behaviour modification is not witnessed.

But still various strategies are not compatible to control all the individual differences. Each person has an individual profile of characteristics, abilities and challenges that result from predispositions, learning and development. Two different persons may not perform in the same manner under same conditions. This suggests that the role of individual differences should be studied in learning through a strategy or
teaching model. Gagne’s discussion of knowledge acquisition frankly acknowledges the importance of individual differences in learning structures or learning sets. Through various experiments this idea emerged out that the performance and learning must be analyzed in terms of relationships between human traits and instructional situation. While studying the effect of teaching models, various independent variables were taken into consideration such as sex, SESS, personality, cognitive development etc. Researchers suggested that general intelligence is most important variable in academic performance. Studies conducted by Kohlberg (1963) and Goodnow and Benthon (1966) showed that high-IQ children outperformed average-IQ children. Research of Inhelder (1943) and Stephens (1972) showed average-IQ children outperformed low-IQ children. In the present study some more important variables like self-efficacy, persistence and study habits were chosen up. Their meaning and role have been discussed in following lines:

(a) **Role of self-efficacy in learning**: Bandura (1997) defined self-efficacy as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments”. Perceived Self- efficacy is defined as people’s beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. People’s beliefs about their efficacy can be developed by four main sources of influence.

1. Setbacks and difficulties in human pursuits serve a useful purpose in teaching that success usually requires sustained effort.
2. Another way of creating and strengthening self-beliefs is through the vicarious experiences provided by social models. Seeing
people similar to oneself succeed by sustained effort raises observer’s beliefs that they too possess the capabilities to master comparable activities required to succeed.

3. Social persuasion is a third way of strengthening people’s beliefs that they have what it takes to succeed.

4. The fourth way of modifying self-beliefs of efficacy is to reduce people’s stress reactions and alter their negative emotional proclivities.

**People with weak belief in their self-efficacy:**
- shy away from difficult tasks (personal threats)
- have low aspirations and weak commitment to the goals they choose
- maintain a self-diagnostic focus (rather than how to perform)
- dwell on personal deficiencies, obstacles & adverse outcomes
- attribute failures to deficient capabilities
- slacken their efforts or give up quickly in face of difficulty
- slow to recover their sense of efficacy after failures or setbacks
- prone to stress & depression

**People with strong belief in the self-efficacy:**
- set challenging goals & sustain strong commitments to their goals
- approach difficult tasks as challenges rather than as threats
- maintain a task diagnostic focus
- attribute failures to insufficient effort
- heighten effort in face of difficulties
- quickly recover their sense of efficacy after failure or setback
- display low vulnerability to stress & depression

However, self-efficacy is an important factor in learning process.
Teachers should provide students with challenging tasks and meaningful activities to increase motivation and their efforts should be supported and encouraged to help ensure self-confidence and eventually self-efficacy. One of the dimensions of self-efficacy is self-regulatory processes which is utilized in making decisions automatic and be exercised unconsciously. Teachers have endeavoured to instil in the students this self-regulatory process so that it will become habits.

Research has indicated that self-efficacy correlates with achievement outcomes. Students with high self-efficacy often display greater performance comparatively to those with low efficacy.

Self-efficacy is also equated with self-competence, hence significant authorities such as parents and teachers who exert great influences should play their role efficiently in enhancing this self-competence and eventually self-efficacy for it has great bearings in achievement, be it in the English language or any other (Rahil Mahyuddin, 2003).

Self – efficacy helps to determine how much effort, perseverance and resilience being put on a task. Efficacy beliefs trigger emotional reactions. For example individuals with low self-efficacy believe that a task is tough and hence build stress, depression and a narrow vision on how to solve problems. On the other hand, those with high efficacy would be more relax in solving difficult tasks. Therefore, these influences are strong determinants of the individual’s level of achievement. Pintrich and Groot (1990) reported that academic self-efficacy is correlated with academic performances in exams and quizzes. Research shows that self-efficacy is significantly associated with students learning, cognitive engagement, analytical thinking, academic commitment, persistence and achievement (Bandura et. al.,
Therefore, self-efficacy was included in the project to study its role in learning from models of teaching.

(b) Role of persistence in learning: Today every individual who is ambitious in some or other form aims at reaching a definite goal in performance and in doing so, he sets a desire for distinction which has an inner structure known as persistence. It is therefore a form of self-motivation involving competition with one’s own past performance.

Oxford dictionary (2001) defines persistence as “continuing to do something in spite of difficulty or opposition”.

English and English (1958) have defined persistence as “an ardent desire to accomplish what one sets out to do”.

In Encyclopedic dictionary of Education, persistence has been defined as “the level at which a person sets certain goals and hopes to reach them. It is the standard by which a person judges his performance as good or bad”.

The term persistence has been used to refer to subjects momentary goals as revealed by their remarks about successes and failure and their modes of attack on the problems assigned to them. Hoppe (1930) represents persistence as a person’s expectations, goals, claims or his future achievement in a given task. He further stresses that the “experiences of performance” as a success/failure does not depend upon its objective goodness alone but also on the persistence reached. Subject tends to lower or raise future goals depending on their success and failure do not attend task which are too easy or too difficult. Hoppe has concluded that persistence is chiefly determined by two sets of
opposing principles in the individual: (a) ego-factor, which tends to set high goals even at the cost of failure; (b) pleasure principles which seek success, thus lowering the persistence.

According to Elliott (1933), “persistence is a term which is best explained as a frame of reference involving self-esteem or alternatively as a standard with reference to which an individual experiences i.e. has the feeling of success or failure”. In Lewin’s view (1944) persistence is the difference between how a person expects or persists to perform on a given task and how actually does he perform. If he succeeds in fulfilling his expectations, persistence raises, if he fails, the persistence falls. Boyd (1952) expressed his view that persistence means “an individual’s ambition in a dynamic situation in regard to the goodness of his own future performance for a given task”.

According to Peel (1962), “when a person is actively involved in a task, he sets himself, a standard to conquer, which is persistence”. Joshi (1963) tried to differentiate persistence from ambition and said “persistence implies a goal which one cherishes to accomplish very ardently in near future, it somewhat closure to ambition but more realistic than ambition”. Eysenck (1972) described persistence as a level of possible goal (scores) an individual sets himself in his performance. Good (1973) describes persistence as the goal that an individual desires or hopes to reach in a specified activity.

Persistence is motivational state of behavior which is likely to have moderating and determining influences on performance and investigators (Atkinson and Litwin, 1960; Feather, 1961; Sinha, 1968) have used it to explain differences in achievement, level of aspiration and academic performance. The term ‘persistence’ is used in a varied sense. Some investigators (Ryans, 1938; Porter, 1936; Crutcher,1934) refer to it as a personality trait while others (French,1938; Throntan,
1939; Mac Arthur, 1955; Atkinson, 1956; Feather, 1961) consider it as a motivational phenomenon, showing meaningful relationship with personality and situational factors.

Persistence is very necessary to sustain an activity towards the attainment of goal. So, persistence can be conceptualized as an acquired behavioral tendency for continuing or perusing and achievement goal in the face of obstacles.

Here the classroom plays an important role in the student learning and persistence process. According to McKeachie (1970, 1974) and Smith (1980, 1983) it is evident that multiple relationships exist between teacher behaviours and student participation in classroom discussions and learning. As numerous researches have suggested (Pascarella and Terenzini, 1980; Astin, 1984; Nora, 1987; Mallette and Cabrera, 1991), that greater the students are academically integrated in the life of the institution, the greater the likelihood that they will persist. The teaching models provide different types of classroom and learning activities. These may affect the persistence level of students. So, the persistence was considered to study its role in the performance through the teaching models.

(c) **Role of study habits in learning:** A habit is something that is done on a scheduled, regular and planned basis that is not relegated to a second place or optional place in one’s life. Therefore, Study Habits can be derived from above as buying out a dedicated, scheduled and uninterrupted time to apply one’s self to the task of learning.

Good study habits are the keys to learning. Everyone cannot be brilliant but everyone can learn how to study. If one knew how to study,
apply what he knows, he will be successful in his study. Knowing the best what to study will help one to be a better student.

Effective study habits, even highly intelligent student failed due to inefficient work and lack of knowledge on how to study effectively. Important skills for study have to be learned and practiced. Moreover, students who put in more classrooms however and who work to a more regular program of study have a better academic performance.

Study habits tend to be formed in the early grades and in the most instances, do not materially improve after elementary school. Some students often complain about mental inability or strain or lack of interest in studies. Other thinks they are not capable.

Azikiwe (1998) describes the study habit as “the adopted way and manner a student plans his private readings, after classroom learning so as to attain mastery of the subject.”

Good study habits are good assets to learners because they assist students to attain mastery in areas of specialization and consequent excellent performance.

Study habit is a factor that influences the reasoning skills of students. It is particularly important to focus on their study habits and attitude towards learning. Covey (2007); Landsberger (2007); Charnley (2006); Zolten and Long (1997); Marioris B Acido (2010); found that students with poor study habits had below average reasoning skills.

In his study Carlo Mango (2010) investigated study habits (delay avoidance, work methods, teacher approval) in Maths & English and found contribution of work method is the strongest than other study habits factor on Mathematics and English.
Naremullah Bajwa, Ajaj Ahmed Gujjar (2010) found that a well-managed study schedule of students of formal system ensures better academic performance than students of distance education system.

Omotere Tope (2011) in his study investigated the effects of study habits on academic performance of students using some selected senior secondary schools in Ogun state and found that family background, peer group pressure, personality type of the student and school environment all affect the reading habit of students in secondary schools.

These studies suggested that learning through teaching models may be affected by the students study habits. So, the study habits were included to study its role in learning through teaching models.

In this way, all the three traits self-efficacy, persistence and study habits appeared to have an important role in learning process and are quite crucial to a learning situation.

**PROBLEM OF THE STUDY:**

Teaching is generally considered as an activity which is designed and performed for multiple objectives, in terms of desirable changes in student’s behaviour. Teaching is a process of fulfilling learning objectives with the help of curriculum and methods of teaching. These learning objectives are assumed to be fulfilled when “desired” changes are seen in the behaviour of the learners.

But the fact is that each learner is different from other in terms of his intelligence, beliefs, attitudes, personality etc. Thus his/her success depends on his/her personal attributes like learning habits, perseverance and attitude etc. So, it becomes very important that appropriate methods or strategies be applied that are compatible with the learner’s attributes.
Various Educationists have transformed prevailing theories and present knowledge into different models of teaching which can be used by schools. These models are based on empirical work, theories of learning, speculations about the meaning of theories and researches done in these areas. Joyce and Weil (1980) have explored the ways of making the theories operational by suggesting various models of teaching. They analyzed these models according to their purpose. Researchers have attempted to establish the direct or indirect effects of these models.

Most of the studies in models of teaching have investigated the effectiveness of various models of teaching like Advance organizer model (Chitriv, 1983), CAM (Bajpaye, 1986), Inquiry training model (Dubey, 1988), Bruner’s model (Kaur, 1991) over traditional method of teaching with reference to student’s achievement.

Other models that have attracted the researcher are Keller’s Personalized System of Instruction (K.P.S.1) and Mastery Learning Strategy (M.L.S.). Researchers have carried a large number of studies comparing the results of P.S.I. classes with those of Lecture classes. Singh, S.B. (1988) and Dasgupta, Dipti (1988) have found P.S.I. to be superior over traditional method in teaching Physics and Economics respectively. Verma, Bipin Chander, (1991) found P.S.I. to be effective in certain non-cognitive variables.

The variables like learning capabilities, student’s willingness (Passi et.al., 1988), motivational level etc. also have been attempted by the researchers. While studying the effect of the teaching model, various independent variables were taken into consideration like sex, socioeconomic status, personality, cognitive development etc. Moreover, most of the studies have been conducted in science at various levels.

All these studies show that Mastery Learning Model and Concept Attainment Model are effective in enhancing student’s performance and have been used widely in science. Therefore, on the basis of above available literature the present investigator drew the analogy and took the project to analyze the student performance from Mastery Learning Model and Concept Attainment Model in context of selected variables like self-efficacy, persistence & study habits.

STATEMENT OF THE PROBLEM:
The problem was stated as below:
EFFECTIVENESS OF MASTERY LEARNING MODEL, CONCEPT ATTAINMENT MODEL AND TRADITIONAL METHOD IN TEACHING SCIENCE IN CONTEXT OF SELF-EFFICACY, PERSISTENCE & STUDY HABITS.

DEFINITION OF THE TERMS USED:
The terms used in the present study have been defined below:-
SELF-EFFICACY: Self-efficacy is a person’s evaluation of his or her own ability or competency to perform a task, reach a goal or overcome an obstacle.
Operationally it refers to one’s own beliefs about their capabilities to produce designated level of performance and as is measured by Self-efficacy scale developed by Shonali Sud.

**PERSISTENCE:** Persistence has been defined as an acquired behavioral tendency for continuing or pursuing an achievement goal in face of obstacles.

Operationally persistence refers to the motivational status of behaviors which have determining influence on performance and as is measured by persistence questionnaire developed by Nisha Dhawan.

**STUDY HABITS:** Study habits have been described as a dedicated, scheduled and un-interrupted time to apply one’s self to the task of learning.

Operationally it refers to the adopted way and manner a student plans his learning activities and as is measured by test of study habits and attitudes by M.C. Joshi and Jagdish Pandey.

**INTELLIGENCE:** Intelligence is ability of readiness, correctness and understanding complicated and abstract things.

**OBJECTIVES OF THE STUDY:**
The main objectives of the study were the following:

1. To study and compare the effectiveness of Mastery Learning Model and Concept Attainment Model over Traditional Method of teaching science in terms of pupil’s performance.

2. To investigate the effectiveness of Mastery Learning Model, Concept Attainment Model and Traditional Method of teaching science in relation to self-efficacy of the learners at High School level.
3. To investigate the effectiveness of Mastery Learning Model, Concept Attainment Model and Traditional Method of teaching science with reference to persistence of the learners.

4. To explore the effectiveness of Mastery Learning Model, Concept Attainment Model and Traditional Method of teaching science in context of the study habits of the learners.

The following were the secondary objectives:

1. To develop two teaching modules on the basis of principles of Mastery Learning Model and Concept Attainment Model in science at High School level.

2. To develop a criterion test for science performance.

**HYPOTHESES:**

In the present study the following hypotheses were formed and tested:

1. There is no significant difference in performance from Mastery Learning Model and Traditional Method of teaching science.

2. There is no significant difference in performance from Concept Attainment Model and Traditional Method of teaching science.

3. There is no significant difference in performance from Mastery Learning Model and Concept Attainment Model in teaching science.

4. There is no significant difference in performance from Mastery Learning Model, Concept Attainment Model and Traditional Method of teaching science with reference to self-efficacy of the learners.
5. There is no significant difference in performance from Mastery Learning Model, Concept Attainment Model and Traditional Method of teaching science with reference to persistence of the learners.

6. There is no significant difference in performance from Mastery Learning Model, Concept Attainment Model and Traditional Method of teaching science with reference to study habits of the learners.

RATIONALE OF THE STUDY:

All human learning especially learning at school by its very nature influences and gets influenced by a multiplicity of factors which depend upon the details pertaining to the teacher, the student and the environment.

Every model of teaching involves certain principles based on some theory. These principles prepare a base for learning in that model. Further each strategy has different motivational and intellectual components which are considered to be inherent. These motivational components differ from person to person and depend upon cognitive & personal variables. These variables interact with learning process and contribute significantly to the effectiveness of that strategy.

Hooda (1982), Koul (1986), Passi et.al. (1988), Vaidya (1990) and others have demonstrated that performance through a teaching strategy may vary according to individual differences.

A study of effectiveness of CAM and MLM in context of certain student characteristics may be immensely helpful in developing a strategy for effective individualized learning.
DELIMITATIONS OF THE STUDY:

The study was delimited in the following manner:

1. The performance of the learners was analyzed only by taking some topics of science at High School level.

2. The performance of the learners was analyzed only in context of selected three learner’s variables.

3. The “group-based/teacher-paced” form of mastery learning and Reception Model of Concept Attainment were followed in the study.

4. Mastery of the following cognitive objectives was set for the study:
   
   (A) Knowledge
   
   (B) Understanding and
   
   (C) Application

5. The study included only students of IX class from Nainital district.

6. The study will be limited in its area, methods & techniques.

This study suffers from these unavoidable limitations.

A brief description of review of related literature has been provided in second chapter.