CHAPTER III
THEORETICAL OVERVIEW
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In the previous chapter review of related literature concerning with the study on concept attainment Model, different teaching models, achievement, attitude and retention of science concepts has been presented. This chapter deals with the detail description of the theoretical overview.

3.1 Philosophy behind models of teaching:

According to the report of the Secondary Education Commission: “Even the best curriculum and the most perfect syllabus remain dead unless quickened to life by the right methods of teaching and the right kind of teacher”. It seems that the teaching learning process has become more mechanical than meaningful. Interesting, appealing and repeated encounter are a must for meaningful learning.

Suitable instructional strategies are essential for achieving the educational objectives. This led researchers to explore various methods and techniques for the development of cognitive, affective and psychomotor domains.

There is no single best way or teaching strategy that can be employed in all situations since the number of teaching goals is large and
diverse in nature. The best technique is the one which will be a most effective or reaching a particular goal in a given situation (Eggen, Kauchack and Harvert, 1979). This is the philosophy behind the Models of Teaching.

3.2 Concept of Models of Teaching:

People in different contexts use the word ‘model’. In the teaching learning process, models have the same interpretation, as they have in the case of construction of dams, buildings, etc. Thus, Models of Teaching, like plans, patterns, or blueprints present the steps necessary to bring about a desired outcome. Models create the necessary environment, which facilitates the teaching learning process. It consists of guidelines for designing educational activities and environments. It is designed to achieve a particular set of objectives. It is not substitute to any teaching skill. Rather, it creates the conductive teaching-learning environment by making the teaching act more systematic and effective. There are many powerful Models of Teaching designed to bring about particular kinds of learning and to help students to learn more effectively. How teaching is conducted, has a large impact on students’ abilities to educate them.

3.2.1 Models of Teaching: Definition:

A Model of Teaching, as explained by Joyce and Weil (1972) is a description of the learning environment. They describe it as “a plan or pattern, which can be used to sharp curricula, to design instructional
materials and to guide instruction in the classroom and other settings”. Models of Teaching have great potentiality for developing the cognitive, affective and psychomotor behaviour of the learner in a balanced and integrated fashion.

A Teaching Model can be considered as a type of blueprint for teaching. It provides structure and direction for teaching. Models of Teaching afford a lively and provocative introduction to the complexity of teaching (Joyce and weil, 1972). It consists of guidelines for designing educational activities and environments.

A Model of Teaching emphasizes the need for variety in the classroom by developing a teacher’s repertoire of instructional approaches to meet a range of objectives. But Models of Teaching are not cure-alls or applicable to all teaching situations. Models of Teaching create the conductive teaching-learning environment in which teachers teach more effectively by making the teaching act more systematic and effective.

3.2.2 Emergence of Models of Teaching:

Although methods of teaching have passed through several developments, teachers all over the world followed fixed ways of teaching. It is because the educational programme for teachers prepares them to follow one of a few mixed ways of teaching, such as the Herbartian Method.
Attempts have been made by researchers to master the different approaches, strategies or styles of teaching with the objectives of instruction and pupils’ learning styles. Dunn and Dunn (1979), Fischer and Fischer (1979), Elis (1979), and Joyce and Weil (1980), also believe that the strength in education rests in the intelligent use of this powerful variety of approaches matching them with different goals and adopting them to the student’s style to reach out to differing children and to create a rich and multi-dimensional environment for them. Models of Teaching emerged out of the search by Joyce and Weil (1972) to find a variety of approaches or strategies of teaching to match the various learning styles.

3.2.3 Characteristics of Models of Teaching:

The main characteristics of Models of Teaching are the following.

1. A Model of Teaching is not a combination of facts but on the other hand it is a systematic procedure to modify the behaviour of the learners,

2. All Models of Teaching specify the learning outcomes in detail on observable student performance,

3. Every Model of Teaching specifies in definite terms the environmental conditions, under which a student’s response should be observed,
4. A Model describes the criteria of acceptable performance, which is expected from the students.

5. All Models of Teaching denote mechanisms that provide for students’ reaction and interaction with the environment.

6. Models of teaching are some sort of plans or guidelines or patterns of strategies of teaching.

7. Models of teaching specify the criteria of acceptable performance expected from the students.

It can be summarized that “A model of teaching implies a way of teaching, involving systematically structured and logically sequential learning experiences and specific and meaningful teaching strategies developed in their own theoretical terms to accomplish a given objective or a set of objectives”. Models of teaching guide us in designing educational activities creating suitable learning environment and situations, in shaping the curriculum, in designing instructional materials and to guiding instruction.

3.2.4 Functions of Models of Teaching:

The following diagram explains the three functions of Models of Teaching.
3.2.5 Classification of Models:

There are many Models of Teaching that are built around the mental process as ranging from systems for teaching general problem solving ability to procedures for teaching process.

Joyce and Weil (1972) developed more than 20 Models of Teaching, which are grouped on the basis of their chief emphasis. They had organized these models into 4 families, which are as follows:

1. Social Interaction models.
2. Personal Models.

4. Information Processing Models.

Diagram 3.2

Classification of Models of Teaching

1. Social Interaction Models: Social interaction Models emphasize the relationship to society, and to other persons, and give priority to the importance of democratic process, and the importance of society. The models in this family are: Group investigation, Social Inquiry, Laboratory methods, Jurisprudential, Role playing and Social Simulation.

2. Personal Models: Personal Models emphasize the process by which the individuals construct and organize their unique reality. These models stress on personal development of an individual and
the development of self-hood. These models emphasize the processes by which individuals can establish a productive relationship with their environment and construct and organize their unique reality. They are more concerned with human feelings and emotions and try to move towards the development of an integrated functioning self. The models included in this family are Non-Directive Teaching, Awareness Training, Synectics, Conceptual systems and Classroom Meeting.

3. **Behaviour Modification Models:** These models attempt to develop efficient systems for sequencing learning tasks and shaping behaviour by manipulating reinforcement. Exponents of the reinforcement theory such as Skinner have developed these models based on the operant conditioning as their central mechanism. They emphasize changing external behaviour of the learners and describe them in terms of visible behaviour. Models included in this family are Contingency Management, Self-control, and Relaxation; Stress Reduction Assertive training, Desensitization and Direct Training.

4. **Information Processing Models:** Information Processing refers to the way pupils handle stimuli from environment, organize data, sense problems, generate concepts and solutions to problems and employ verbal and non-verbal symbols (Joyce and Weil, 1978).
These models aim at fostering the information processing ability in the learners. In other words, these models help the learners to seek and master information, organize it, build and test hypotheses. It involves intellectual skills required to analyze information, which include the ability to make observation and through the use of inference, to generalize, to predict and to explain events (Eggen, P.et.al 1979). The major models in this family are: Inductive Thinking, Inquiry Training, Concept Attainment, Cognitive Growth, Advance Organizer and Memory Model.

The diagrammatic representation of the families of models is given below.
The main Models that are coming under the Information Processing Family are given in Table 3.1
Table 3.1
Models coming under Information Processing Family.

<table>
<thead>
<tr>
<th>Model</th>
<th>Major Theorists</th>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inductive Thinking Model</td>
<td>Hilda Taba</td>
<td>Designed primarily for development of model inductive mental process and academic reasoning, of theory building but these capacities are useful for personal and social goals as well.</td>
</tr>
<tr>
<td>Inquiry Training Model</td>
<td>Richard Suchman</td>
<td>Designed for the development of thinking skill in students</td>
</tr>
<tr>
<td>Scientific Thinking Model</td>
<td>Joseph J schwab</td>
<td>Designed to teach the research system of discipline, but also expected to have effect instructionally the other domains</td>
</tr>
<tr>
<td>Concept Attainment Model</td>
<td>Jerome S. Bruner</td>
<td>Designed primarily to develop and achieve reasoning but also for concept development and analysis</td>
</tr>
<tr>
<td>Advance organizer Model</td>
<td>David P. Ausubel</td>
<td>Designed to increase efficiency of information processing capacities meaningfully absorbs and relate bodies of knowledge</td>
</tr>
<tr>
<td>Developmental Models</td>
<td>Jean Piaget, Irvin Sigel and Emund Sullivan</td>
<td>Designed to increase the general intellectual developments especially logical reasoning.</td>
</tr>
<tr>
<td>Memory Model</td>
<td>Jerry Lucas</td>
<td>Designed to increase the capacity of memorization.</td>
</tr>
</tbody>
</table>
### 3.2.6 Components of a teaching Model:

The components of a teaching model, according to Joyce and Weil (1978) are as follows:

1. Syntax
2. Social system
3. Principles of reaction
4. Support system and
5. Instructional and Nurturant effects

1. Syntax:

The syntax describes the Model in action. It is the sequence of activities called phases. Each Model has a distinct flow of phases. Comparing the phases of Model reveals the practical difference between Models.

2. Social system:

Social system describes student and teacher roles and relationship and the kind of norms that are encouraged. The concept of hierarchical relationship is explained as the sharing of intimating activity by the teacher and the learner, the location of authority, and the amounts of control over activity that emerges from the process of interaction. On the basis of social system, Models can be classified as highly structured, moderately structured, and low structured models.
3. Principles of reaction:

Principles of reaction guide the teacher’s responses to the learner. They tell how to regard the teacher and respond to what he or she does. In some models, the teacher overtly tries to shape the behaviour of the students by rewarding certain student’s activities and maintaining a natural stance towards others. Principles of reaction provide the teacher with rules of the thumb by which to “tune in” to the student and select an appropriate response to what the student does.

4. Support systems:

Support system refers to additional requirements beyond the usual human skills, capacities and technical facilities necessary to implement a Model.

5. Instructional and Nurturant effects:

The description of the effects of a Model can validly be categorized as the direct or instructional effects and indirect or nurturant effects. The instructional effects are those directly achieved by leading the learner in certain directions.

3.3 Concept attainment model:

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, p.233). Whereas concept formation, which is the basis of inductive model, requires the
students to decide the basis on which they build categories, concept attainment requires student to figure out the attributes of a category that is already formed in another person’s mind by comparing and contrasting examples (called exemplars) That contain the characteristics (called attributes) of the concept with examples that do not contain those attributes. To create such lessons we need to have our category clearly in mind. As an example let us consider the concept adjective. Adjectives are words, so we select some words that are adjectives (these become the positive exemplars) and some that are not (these become “negative” exemplars—the ones that do not have the attributes of the category adjective). We present the words to the students in pairs.

**Rationale:**

We have used terms such as exemplar and attribute to describe categorizing activity and concept attainment. Derived from Bruner’s study of concepts and how people attain them, each term has a special meaning and function in all forms of conceptual learning, especially concept attainment.

**Exemplars:**

Essentially the exemplars are a subset of a collection of data or a data set. The category is the subset or collection of samples that share one or more characteristics that are missing in the others. It is by comparing the
positive exemplars and contrasting them with the negative ones that the concept or category is learned.

Attributes:

All items of data have features, and we refer to these as attributes. Nations, for example, have areas with agreed-on boundaries, people, and governments that can deal with other nations. Cities have boundaries, people, and governments also, but they cannot independently deal with other countries. Distinguishing nations from cities depends on locating the attribute of international relations.

Essential attributes are attributes critical to the domain under consideration. Exemplars of a category have many other attributes that may not be relevant to the category itself. For example, nations also have trees and flowers, but these are not relevant to definition of nation—although they, too, represent important domains and can be categorized and subcategorized as well. However, with respect to the category “nation”, trees and flowers are not essential.

Another important definition is that of attribute value. This refers to the degree to which an attribute is present in any particular example. For instance, in any given situation everyone has some rationality and irrationality mixed together. The question is when there is enough rationality that we can categorize someone as “rational” or enough irrationality that “irrational” is an appropriate description.
some types of concepts—triangle for example—attribute values are not a consideration. For others, they are. When creating a data set for instruction, it is wise to begin with exemplars where the value of the attribute is high, dealing with the more ambiguous ones after the concept has been well established. Thus, when classifying nations according to wealth, beginning with the very rich and the very poor makes it easier for the students. As we categorize things. We have to deal with the fact that some attributes are present to various degrees. We have to decide whether any amount of presence of an attribute is sufficient to place something in particular category and what the range of density is that qualifies something belong to a category. For example, consider the category poisonous. We put chlorine in water precisely because chlorine is poison. Yet we judge the amount that will kill certain bacteria and still not harm us. So tap water in a city is not an exemplar of poisonous water because it does not contain enough poison to harm us. But if we added enough chlorine, it would affect us. In this case, if the value of the attribute is low enough, its presence does not give the water membership in the category poisonous to humans.

Now consider the category short person. How short is short enough to be so categorized? People generally agree on a relative value, just as they do for tall. When is something cold? Or Hot? When is a person friendly? Hostile? These are all useful concepts, yet the
categorization issue turns on matters of degree, or what we all attribute value.

In other cases, value is not a consideration. To be a telephone, an instrument simply must have certain characteristics. Yet there are degrees of quality. A question such as, “when is a sound machine a high-fidelity instrument?” puts us back in to the consideration of attribute values.

Once a category is established, it is named so that we can refer to it symbolically. As the students name the categories, they should do so in terms of attributes. However, the concept attainment process is not one of guessing names. It is to get the attributes of a category clear. Then the name can be created or supplied. Thus, the name is merely the term given to a category. *Fruit, dog, government, ghettos are* all names given to a class of experiences, objects, configurations, or processes. Although the items commonly grouped together in a single category may differ from one another in certain respects (dogs, for example, vary greatly), the common features cause them to be referred to by the same general term. Often we teach ideas that students already know intuitively without knowing the name itself. For instance, young children often put pictures of fruit together for the reason that they are “all things you can eat”. They are using one characteristic to describe the concept instead of the name or label. If students know a concept, however, they can easily learn
the name for it, and their verbal expressions will be more articulate. Part of knowing a concept is recognizing positive instances of it and also distinguishing closely related but negative examples. Just knowing terms will not suffice for this. Many people know the terms metaphor and simile but have never clarified the attributes of each well enough to tell them apart or apply them. One cannot knowingly employ metaphoric language without a clear understanding of its attributes.

*Multiple attributes* are another consideration. Concepts range from cases in which the mere presence of a single attribute is sufficient for membership in a category to those in which the presence of several attributes is necessary. In literature, social studies, and science we deal with numerous concepts that requires the presence of several attributes simultaneously. In literature, social studies, and science we deal with numerous concepts that are defined by the presence of multiple attributes, and sometimes attribute value is a consideration also. Consider the theoretical concept romantic comedy. A positive example must be a play or film; it must have enough humor to qualify as a comedy, and must be romantic as well. Negative exemplars include plays that are neither funny nor romantic, are funny but not romantic, and are romantic but not funny.

To teach a concept, we have to be very clear about its defining attributes and about whether attribute values are considerations. We must
also select our negative exemplars so that items with some but not all the attributes can be ruled out.

The phases of the concept attainment model are outlined in ‘Table 3.2.

Table 3.2
Phases in the Concept-Attainment Model

<table>
<thead>
<tr>
<th>PHASE -I</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESENTATION OF DATA AND IDENTIFICATION OF CONCEPT</td>
<td>Teacher represents labeled examples. Students compare attributes in positive and negative examples. Students generate and test hypotheses. Students state a definition according to the essential attributes.</td>
</tr>
<tr>
<td>PHASE -II</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>TESTING ATTAINMENT OF THE CONCEPT</td>
<td>Students identify additional unlabeled examples as yes or no. Teacher confirms hypotheses, names concept, and restates definitions according to essential attributes. Students generate examples.</td>
</tr>
<tr>
<td>PHASE –III</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>ANALYSIS OF THINKING STRATEGIES.</td>
<td>Students describe thoughts. Students discuss role of hypotheses and students discuss type and number of hypotheses.</td>
</tr>
</tbody>
</table>

3.4. Components of concept attainment model:

Syntax:

Phase one involves presenting data to the learner. Each unit of data is a separate example or non-example of the concept. The units are presented in pairs. The data may be events, people, objects, stories, pictures, or any other discriminable units. The learners are informed that
all the positive examples have one idea in common; their task is to develop a hypothesis about the nature of the concept. The instances are presented in a prearranged order and are labeled yes or no. Learners are asked to compare and justify the attributes of the different examples. (The teacher or students may want to maintain a record of the attributes.) Finally, learners are asked to name their concepts and state the rules or definitions of the concepts according essential attributes. (Their hypotheses are not confirmed until the next phase; students may not know the names of some concepts, but the names can be provided when the concepts are confirmed.)

**In phase two,** the students test their attainment of the concept, first by correctly identifying additional unlabeled examples of the concept and then by generating their own examples. After this, the teacher (and students) confirm or disconfirm their original hypotheses, revising their choice of concepts or attributes as necessary.

**In phase three,** students begin to analyze the strategies by which they attain concepts. As we have indicated, some learners initially try broad constructs and gradually narrow the fields; others begin with more discrete constructs. The learners can describe their patterns-whether they focused on attributes or concepts, whether they did so one at a time or several at once, and what happened when their hypotheses were
not confirmed. Did they change strategies? Gradually, they can compare the effectiveness of different strategies.

**Social System:**

Prior to teaching with the concept attainment model, the teacher chooses the concepts, selects and organizes the material into positive and negative examples, and sequences the examples. Most instructional materials, especially text books, are not designed in a way that corresponds to the nature of concept learning as described by educational psychologists. In most cases teachers will have to prepare examples, extract ideas and materials from texts and other sources, and design them in such a way that the attributes are clear and that there are, indeed, both positive and negative examples of the concept. When using the concept attainment model, the teacher acts as a recorder, keeping track of the hypotheses (concepts) as they are mentioned and of the attributes. The teacher also supplies additional examples as needed. The three major functions of the teacher during concept attainment activity are to record, prompt (clue), and present additional data. In the initial stages of concept attainment, it is helpful for the examples to be very structured. However, cooperative learning procedures can also be used successfully.

**Principles of reaction:**

During the flow of the lesson, the teacher needs to be supportive of the students’ hypotheses-emphasizing, however, that they are
hypothetical in nature—and to create a dialogue in which students test their hypotheses against each others’. In the later phases of the model, the teacher must turn the student’s attention toward analysis of their concepts and their thinking strategies, again being very supportive. The teacher should encourage analysis of the merits of various strategies rather than attempting to seek the one best strategy for all peoples all situations.

**Support system:**

Concept attainment lessons require that positive and negative exemplars be presented to the students. It should be stressed that the students’ job in concept attainment is not to invent new concepts, but to attain the ones that have previously been selected by the teacher. Hence, the data sources need to be known beforehand and the attributes visible. When students are presented with an example, they describe its characteristics (attributes), which can then be recorded.

**Instructional and Nurturant Effects:**

The concept attainment strategies can accomplish several instructional goals depending on the emphasis of the particular lesson. They are designed for instruction on specific concepts and on the nature of concepts. They also provide practice in inductive reasoning and opportunities for altering and improving students’ concept-building strategies. Finally especially with abstract concepts, the strategies nurture
an awareness of alternative perspectives, sensitivity to logical reasoning in communication, and a tolerance of ambiguity (see Figure 3.4)

**DIAGRAM 3.4**

Instructional and nurturant effects: concept attainment model.

Robert Gagne’s 1965 article thoroughly discusses a similar approach to concept attainment. Merrill and Tennyson (1977) describe a similar approach without, however, an extensive analysis of the thinking processes. McKinney, Warren, Larkins, Ford, and Davis (1983) have reported a series of interesting studies comparing the Merrill/Tennyson
approaches with Gagne’s and a recitation procedure. Their work illustrates the complexity of designing studies to meaningfully compare sets of models built on the same premises but differing in details of execution. However, the differences in approach and the research to build better models are probably of less importance to teachers than the fact that there are models that do good job of teaching concepts- ones more powerful than the way concepts have traditionally been taught-and therefore represent useful additions to the teaching/learning repertoire. The model we have been discussing is one of them.