CHAPTER II

MODELS OF TEACHING – THEORETICAL OVERVIEW

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CHAPTER II
MODELS OF TEACHING– THEORETICAL OVERVIEW

This chapter is specially designed to give an insight into the theory of ‘Models of Teaching’ with special reference to The Advance Organizer Model (AOM) of the Information Processing Family.

2.1 PHILOSOPHY BEHIND MODELS OF TEACHING

Human beings are born with latent urges, abilities, capacities, interests, aptitudes and other personality traits. It is the prime concern of education to stimulate and guide these undeveloped capabilities to the most desirable channels. The prime objective of the present education is to meet the emerging challenges of the process of globalization. To carry out these multi-dimensional objectives suitable Instructional strategies are essential. This led researchers to explore various methods and techniques, which resulted in a balanced and integrated development of cognitive, affective and psychomotor behaviour of the pupil.

In-depth knowledge about diverse philosophies of teachings will help teachers to guide the learners more optimally. Vital subject matter, which has values in and out, should be chosen for instruction. Teacher should understand and implement predetermined objectives in measurable terms for pupil achievement. Teacher can adopt a problem solving approach in teaching where decision-making skills are emphasized. In order to help teachers in this regard there are selected principles from the psychology of learning which need to model and implement. To meet the Instructional goals, a number of teaching strategies have been developed by educationists and psychologists based on firm learning theories. But there is no single best way that can be employed in all situations. The best technique is the one, which will be most effective for reaching a particular goal in a given situation (Eggen, Kauchak and Harder, 1979). This is the philosophy behind Models of Teaching.
2.2 MODELS OF TEACHING

Teaching means helping students to learn well. Powerful learners have a wide range of strategies for acquiring knowledge. Models of Teaching were designed to impart to learners such strategies, which will help learners to think clearly and wisely and build social skills and commitment. They help students to acquire information, ideas, skills, values, and ways of thinking and means of expressing themselves in a nutshell. They are taught how to learn (Eggen, Kauchak and Harder, 1979). Models of Teaching include many but not all of the major philosophical and psychological orientations towards teaching and learning. Each of them has coherent theoretical bases (Joyce and Weil, 1972).

The models approach to teaching was first described by Joyce and Weil (1972), who defined a model as “a pattern or plan which can be used to shape a curriculum or course to select Instructional material and to guide teachers action. Eggen (1979) defines Models as prescriptive teaching strategies designed to accomplish particular Instructional goals. Model differs from general teaching strategies because of this principle. General approaches to teaching are considered to be applicable to all teaching situations. But these Models of Teaching are not cure-alls or applicable to all teaching situations. Dececco (1968), making a distinction between teaching models and a theory of teaching says that, models do not have the rigor of tested theories. Some useful models may eventually give way to empirically tested theories. Models of Teaching is a tool to help good teachers teach more effectively by making their teaching more systematic, But they are not substitute for teaching skills. They are rather complementary (Eggen, Kauchak and Harder, 1979).

A model of teaching consists of guidelines for designing educational activities and environment. It specifies ways of teaching and learning that are intended to achieve certain kinds of goals. The use of models requires an ability to identify different types of Instructional goals so that specific model can be selected to match a particular goal. A teaching model can be
considered as a type of blueprint for teaching (Eggen, Kauchak and Harder, 1979).

Models of Teaching are really models of learning. They are designed to bring about particular kinds of learning and to help students become more effective learners. It helps students to acquire information, ideas, skills, values, and ways of thinking and means of expressing themselves. It teaches the students, ‘how to learn’ (Joyce and Weil 1972). Increasing aptitude to learn is one of the fundamental purposes of these models. Models of Teaching enable the students to become powerful students (Joyce and Weil 1972)

2.3 CLASSIFICATION OF MODELS

Educators, Psychologists, Sociologists, System analysts, Psychiatrists and many others have developed theoretical positions about teaching and learning. A number or educationists have developed Models of Teaching from different sources such as classroom situations, research in psychology and training, therapies and theories. But Bruce Joyce and Marsha Weil brought about the revolutionary changes in Instructional strategies.

Joyce and Weil grouped the models that they have discovered on the basis of their chief emphasis – the ways they approached educational goals and means. They have organized these models into four families:

1. The Information Processing Family
2. The Social Family
3. The Personal Family
4. The Behavioural Systems Family

2.3.1 The Information Processing Family

The models in this family are designed to teach students the skills of learning through thinking. They aim at increasing student’s ability to seek and master information, organize it, build and test hypotheses, apply what they are learning in their independent reading and writing and their exploration of themselves and the world around them.
2.3.2 **The Social Family**

Man is a social creature. The models under Social Family range from the simplest processes of organizing students to work together to elaborate models that teach democratic social organization, analysis of major social problems and critical social values and issues. The models in this family emphasize the relationship of the individual with the society or other person. The core objective is to help students learn to work together, to identify and solve problems, either academic or social in nature. Consequently, with respect to goals, models from this orientation, give priority to the improvement of the individuals ability to relate others, the improvement of democratic processes and the improvement of the society (Joyce and Weil 1978).

2.3.3 **The Personal Family**

The models in this family focus on the individual and give emphasize on the development of integrated feeling, thinking self – the personal identity. They shape the environment around the capacity for self-education and the need to develop self-awareness and understanding. Models belonging to this family, share an orientation towards the individual and the development of selfhood. The emphasis of this model is on developing an individual into an integrated confident and competent personality. They attempt to help students understand themselves and their goal, and to develop the means for educating themselves.

2.3.4 **The Behavioural Systems Family**

The models in this family are developed taking into consideration the human beings ability to modify behaviour in response to tasks and feedback. These models are used in a wide variety of application from teaching information, concepts and skills, to increasing comfort and relaxation, decreasing phobias, changing habits, and learning to control one’s behaviour. These models are evolved from attempts to develop efficient systems for sequencing learning tasks and shaping behaviour of the learner and describe
them in terms of visible behaviour rather than understanding an unobservable behaviour.

### 2.4 THE TEACHING ACT – THREE PHASE APPROACH

Teaching is often thought of as something that comes rather naturally to individuals who know their subject. Teaching is a triad of sequential interrelated acts or phases. A teacher who develops any learning experiences first plans then implements his plans and finally evaluates the success of the learning activity (Eggen, Kauchak and Harder, 1979).

#### 2.4.1 Planning Phase

In the planning phase the teacher establishes goals, defines it in terms of measurable objectives and selects a teaching model to accomplish these goals. In short, to be able to perform planning effectively, a teacher must have clear precise goals in mind as well as a number of teaching strategies available.

#### 2.4.1.1 Instructional and Nurturant Effects

The teacher has to think of another crucial aspect while planning the lesson. This is about Instructional and Nurturant effects. The effect of an environment can be direct or can be implicit in the learning environment. The Instructional effects are those directly achieved by leading the learner in certain directions. The Nurturant effects come from experiencing the environment created by the model. (Joyce and Weil, 1978).

### 2.4.2 Implementing Phase

In the implementing phase, the teacher utilizes a particular model to accomplish the goals established in planning phase. In the implementation stage, learning activity can take many forms such as discussion, lecture, laboratory activity or simulation (Joyce and Weil, 1978). Each model is based on some theory that has been available for many years. To translate a theory into practical form Joyce and Weil employed a set of four concepts: Syntax, Principle of Reaction, Social System and Support System (Joyce and Weil, 1978). The operation of each model is described within this structure.
2.4.2.1 **Syntax**

Syntax or phasing of the model describes the model in action. It is described in terms of sequence of events called phases. Each model has a distinct flow of phases (Joyce and Weil, 1972).

2.4.2.2 **Principle of Reaction**

Principle of reaction guides the teacher’s response to the learner. It guides the teacher how to regard the learner and respond accordingly. (Joyce and Weil, 1972)

2.4.2.3 **The Social System**

The social system describes students’ and teachers’ roles and relationship and the kinds of norms that are encouraged. The leadership roles of the teacher vary greatly from model to model (Joyce and Weil 1972)

It refers to additional requirements beyond the usual human skills, capacities and technical facilities necessary to implement a model.

2.4.3 **Evaluating Phase**

The teacher’s success in accomplishing the goal is measured in the evaluating stage. Here teacher attempts to gather information that can be used to determine whether his teaching has been successful.

Every teacher faces a wide range of problems in the classroom. The Models of Teaching give ample scope to the teacher to adapt to suit the classroom requirement. Educational goals have been divided into three main areas—Cognitive, Affective and Psychomotor. Among these areas, our elementary and secondary schools are primarily oriented towards goals in the cognitive domain. Cognitive goals are primarily concerned with the intellectual growth of individual. An important set of goals in this cognitive domain is called information processing. An effective teacher is the one who applies the Models of Teaching resourcefully and creatively to solve his problems.

2.5 **INFORMATION PROCESSING MODELS OF TEACHING**

The information processing system of the human being is a set of ideas that provide anchors for new information or ideas as these are received and which provide a storehouse when new meanings are acquired. As this
information processing system acquires new information and new ideas, it recognizes itself to accommodate those ideas and thus it is in a perpetual state of change. New ideas and information can be usefully learned and retained only to the extent that they are retainable to already available concepts or proposition, which provide ideational anchors.

Information Processing Models share an orientation towards the information processing capability of students and towards the systems that can improve their information processing capability. Information processing refers to the ways people handle stimuli from the environment, organize data, sense problems, generate concepts and solutions to problems and employ verbal and nonverbal symbols (Joyce and Weil 1978)

Some Information Processing Models are concerned with the ability of the learner to solve problems and thus encourage productive thinking and some other are concerned with promoting general intellectual ability (Eggen, Kauchak and Harder, 1979).

### 2.6. GOALS OF INFORMATION PROCESSING MODELS

Information Processing focuses attention on the acquisition of knowledge through an analysis of data gathered from the environment. It also helps the students to develop the thinking skills, which will allow them to learn on their own.

The goal of the model is to help students develop schemata and to structure knowledge. It is designed to teach organized bodies of content or help learners organize already understood concepts and generalization into an overall schema. A model can very effectively serve two primary functions. First, it can be used as a means for organizing content to be taught in an entire course, a unit within a course, or a single lesson. It is an aid for helping the teacher to decide on the scope and sequence of the content and it can aid the students as a guide in their progress throughout the material. A model is an organizing scheme for the content, the specifics of which were presented separately in each of the succeeding chapters. Secondly, the model helps the
learners structure previously learned concepts and generalization into comprehensible schemata

Only creative flexible and resourceful teachers will achieve the maximum benefit from the Models of Teaching. Teachers who are interested in Information Processing goals have a dual objective. One is to help students acquire bodies of useful information and other is to help them develop the thinking skills, which will allow them to learn on their own.

Information Processing teaching strategies are based upon a relatively new movement in psychological thinking which views the learner as an active investigator of environment rather than a passive recipient of stimuli and rewards.

Eggen, Kauchak and Harder, (1979), states that the major goals of Information Processing in classroom are the development of intellectual capabilities and acquisition of content. According to them, the information processing activities in classroom have the following three characteristics:

1. Information is attained by students.
2. The data are processed by students into useful concepts and generalizations
3. Information is converted into more useful form.

Thus information processing occurs in the classroom, when learners are actively involved in analyzing data to form abstractions such as concepts, generalizations and theories. Models belonging to this family are given below.

<table>
<thead>
<tr>
<th>Models</th>
<th>Major theorists</th>
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</thead>
<tbody>
<tr>
<td>1. Inductive Thinking Model</td>
<td>Hilda Taba</td>
</tr>
<tr>
<td>2. Inquiry Training Model</td>
<td>Richard Suchman</td>
</tr>
<tr>
<td>4. Concept Attainment Model</td>
<td>Jerome S Bruner</td>
</tr>
<tr>
<td>6. Advance Organizer Model</td>
<td>David P Ausubel</td>
</tr>
<tr>
<td>7. Memory Model</td>
<td>Jerry Lucas</td>
</tr>
</tbody>
</table>

(Joyce and Weil, 1978)
Among these models Advance Organizer Model is useful to structure extended curriculum sequences or courses and to instruct students systematically in the key ideas of a field. The model can be shaped to teach the skills of effective reception learning. Critical thinking and cognitive reorganization can be explained to learners and they can apply these techniques independently to new learning. Whenever ideas or information need to be presented renewed or clarified the Advance Organizer Model is useful. After introducing new material by using Advance Organizer Model, deductive presentational way can be followed by inductive concept attainment activities that reinforce the material or that informally evaluate student’s acquisition of the material.

2.7 ADVANCE ORGANIZER MODEL

Advance Organizer Model is based upon the Learning Theory of Meaningful Verbal Learning formulated by David P Ausubel, an unusual educational theorist. The theory of Meaningful Verbal Learning applies to situation where the teacher plays the role of lecturer or explainer. The main purpose is to help students acquire subject matter.

The Ausubel model is a deductive information processing model designed to teach interrelated bodies of content. He firmly espouses the view that each academic discipline has a hierarchically organized structure of concepts, which form the information processing system of that discipline. He conceptualizes the discipline as levels of hierarchically organized concepts that begin with perceptual data at the bottom and proceeds through increasing levels of abstraction until the most abstract concept appear at the top so as to include or subsume less inclusive concept at lower stages of organization. These concepts are firmly linked to data to have a unique structural character. Like Bruner, Ausubel believes that structural concepts of each discipline can be identified and taught to the students and they then become an information processing system, which serves as an intellectual map, which can be used to analyze particular domain and solve problems within those domains of activities.
The Advance Organizer strategy operates both substantively and programmatically on the learning material. Substantively it utilizes the basic organizing concepts and principles with the widest explanatory power, inclusiveness, generality and readability of a given discipline. In this way the availability of relevant subsumers in the cognitive structure is ensured.

Ausubel emphasizes that in learning, meaningful process is essential. Material has to related to established ideas in the cognitive structure of the learner in terms of ideas, which enable the material to be learned in a logically coherent way. In order to accomplish this, the learner needs access during the learning process to structure ideas that can subsume the new material to be learned and incorporate into the cognitive structure of the learner and provide him with anchors for the new material.

Advance Organizer Model can be applied to any material, which can be organized intellectually. It can be used in nearly every subject area, although it was designed for use with verbal material rather than with skills and mastery of problem solving paradigms. However, Ausubel assumes that it will be useful in the transfer of material to new problem settings. It provides a very good discipline for lectures. It can serve very well in the analysis of expository material in textbooks and other Instructional materials where abstractions and information alternate in various patterns.

Advance Organizer Model is useful to structure extended curriculum sequences or courses and to instruct students systematically in the key ideas of a field. The model can be shaped to teach the skills of effective reception learning. Critical thinking and cognitive reorganization can be explained to learners and they can apply these techniques independently to new learning. Whenever ideas or information need to be presented renewed or clarified the Advance Organizer Model is useful.

Ausubel makes no attempt to handle the tasks, which are necessary in order to utilize Advance Organizer in inductive as well as reception learning. It seems logical that some modification would have to be made of the usual discovery procedures to accommodate the use of Advance Organizer.
Although Ausubel stresses written and verbal material and expository or didactic presentation, this need not be a hard and fast rule. Advance Organizer Model is never purely expository in the interactive situations. Children can raise their own questions. The material being organized can take the form of dialogue. It can also be contained in a film a demonstration or stories.

To facilitate both stability and meaning, one needs to create ideational linkage between the students’ own cognitive structure and that of the discipline to be taught. Ausubel uses two principles to organize curriculum and instruction: *progressive differentiation and integrative reconciliation*.

Progressive differentiation refers to the most general ideas of the discipline presented first followed by a gradual increase in details and specificity. When subject matter is programmed in accordance with the principle of progressive differentiation the most general and inclusive ideas of a discipline are presented first and progressively differentiated in terms of detail and specificity. This can occur in a number of ways. One of the most common forms of progressive differentiation is the breaking down of superordinate into subordinate concepts. Another form of progressive differentiation involves the breaking of concept into its constituent parts. And a third form is the breaking down of broader generalization into more specific ones. This type can often involve the use of examples to illustrate the generalization being discussed.

Progressive differentiation is followed both in intra and inter unit planning. Each component unit has an organizer. In relation to each other, the units are progressively differentiated in descending order of inclusiveness so that each unit serves as an organizer for the one, which follow.

Integrative reconciliation refers to the practice of interrelating or cross-referencing these units or ideas so that significant similarities and differences are recognized and real or apparent inconsistencies are reconciled. Integrative reconciliation simply means that new ideas should be consciously related to previously learned content. The sequence of curriculum is
organized so that each successive learning is carefully related to what has been presented before.

In integrative reconciliation, teacher attempts to make the logical relationship between ideas in the developing schema apparent to students. Ausubel explained the purpose of integrative reconciliation as being “to explore relationships between ideas and to point out significant similarities and differences and to reconcile real or apparent inconsistencies” (1963). Another function of integrative reconciliation is to combat compartmentalization.

There are two types of integrative reconciliation – Vertical and Horizontal reconciliation. Vertical reconciliation explores relationship between more and less abstract ideas and is designed to insure that new ideas between attached to old in a hierarchical fashion. Horizontal reconciliation investigates similarities and differences between coordinate concepts and other ideas at a similar level of abstraction.

By following these two principles, the subject matter is gradually built in the mind of the learner. If the entire learning material has been conceptualized and presented according to Progressive differentiation then Integrative reconciliation follows naturally. Progressive differentiation and Integrative reconciliation increase the stability and clarity of existing ideational anchorage and ensure discriminability of the learning task.

The heart of Ausubel's approach entails the use of Advance Organizers. Advance Organizers consist of introductory material presented ahead of learning task at a higher level of abstraction generality and inclusiveness than the learning task itself. The function of Advance Organizers is to provide ideational scaffolding for the stable incorporation and retention of the more detailed and differentiated material that follows the learning passage as well as increase discriminability between the latter and related inferring concepts in the cognitive structure.
Advance Organizer is an idea that can provide the learner with the conceptual framework on which he can hang the new material progressively from lesson to lesson. New Organizer relates the new material to ideas that have been presented previously. As these organizers accumulate they form in the learner's mind the information processing structure from the discipline. Thus by the end of series of units or activities the learner possesses a new set of ideas. These will serve in the mind to keep the new material distinct and clear by providing ideational scaffolding to which the new ideas are attached and which may help to remember the new material. In addition, they provide ideas to which he can relate his present cognitive structure so that the new material can be integrated with the ideas that was previously using for processing information.

The organizer is important content in itself and needs to be taught. Time must be taken to explain and develop the organizer. Usually organizer is tied closely to the material it precedes. However the organizer can be conceptually distant in order to provide a new perspective.

Advance Organizers are the result of a teacher's conscious attempt to preview and structure the new material to be learned and to link it to content already existing in students pre-existing schemata. In a sense, Advance Organizers are like cognitive read maps, which allow seeing where they have been and where they are going. Effective Advance Organizers connect new information to existing schemata and provide students with a means to create new schemata. They are at a higher level of abstraction than the content they organize and they subsume this information (Luiton, Ames, & Ackerson, 1980).

Ausubel describes two types of organizers and identifies their optimal applications. There are two types of organizers – *Expository* and *Comparative*. The organizers, which provide ideational anchorage, for completely unfamiliar material, are called expository organizers. This Advance Organizer strategy advocates those methods of presenting and ordering the subject matter sequence that best enhance the clarity and stability of the
cognitive structure. This method follows the principle of Progressive differentiation and Integrative reconciliation. This will provide a holistic conceptual structure to which the learner can relate the new material. Expository Organizer provides a general subsumer for a new class, subclass and species before more limited subsumers are provided for the particular subclasses or species. Expository Organizers are especially helpful because they provide ideational scaffolding for unfamiliar material. The organizer in this case provides ideational anchorage in terms that are already familiar to the learner.

Comparative Organizers are used most with relatively familiar material. They are designed to integrate new concepts with basically similar concepts existing in the cognitive structure; yet they are also designed to discriminate between the old and new concepts in order to prevent confusion caused by similarity. When relatively familiar material is being presented to the learner, Ausubel recommends a comparative organizer, which will help the learner integrate new concepts with basically similar concepts in cognitive structure, which increase discriminability between new and existing ideas, which are essentially different but confusable.

The organizer has a higher level of abstraction generality and inclusiveness of the material and is selected on the basis of its suitability for explaining integrating and interrelating the material. An Organizer is a general idea which is fairly abstract, related to the material and which precedes the material. It functions cognitively to organize the material as it is presented. It provides a kind of conceptual framework into which the learner will integrate the material.

Thus Advance Organizers are statements, which are introduced in advance of the learning material itself and are designed to help students learn and retain new material. The Advance Organizer links the new material to more abstract ideas, which already exist in the learners mind.

In a review of research, Mayer (1984) listed a number of characteristics of Advance Organizers:
1. They are typically a short set of verbal or visual information
2. They are presented prior to learning a larger body of information
3. They contain no specific content from the new information to be learned
4. They provide a means of generating logical relationship in the new material
5. They influence the learners encoding process.

The exact form that an Advance Organizer takes is dependent upon
1. The nature of the learning material
2. The age of the learner
3. The degree of prior familiarity with the learning material

The essence of strategy rests on the Advance Organizer functioning as a conceptual linkage from material to the learner. If the student never receives or perceives the organizer the strategy is lost. Advance Organizer is the primary means of strengthening cognitive structure and enhancing retention of new information. The purpose of Advance Organizer is to explain, integrate and interrelate the material in the learning task with previously learned material and also help to discriminate new material from previously learned material. The most effective organizer is that which uses concepts terms and proposition that are already familiar to the learner as well as appropriate illustrations and analogies.

In short it can be concluded that Advance Organizers are not reviewing of what was covered in the previous class, a simple overview, recalling what was done last week or last year, telling the students about tomorrow, recalling a personal experience and relating it to what will be learned or stating the objectives of the lesson. But Advance Organizers are organizational clues, tools that help to connect the known to the unknown, and frameworks for helping students understand study materials.
2.7.1 Goals of Advance Organizer Model

Ausubel’s primary concern is to help teachers convey large amount of information as meaningfully and efficiently as possible. The Advance Organizer Model is designed to strengthen student’s cognitive structures. Cognitive structure is the term used to represent a person’s knowledge of particular subject matter at any given time and how well organized, clear and stable it is. Ausubel maintains that a person’s existing cognitive structure is the foremost factor deciding whether new material will be meaningful and how well it can be acquired or retained. Before presenting new material stability and clarity of prior knowledge should be increased. Strengthening student’s cognitive structure in this way facilitates acquisition and retention of new information and is one of the model’s primary goals.

In short, Advance Organizer Model strengthens Cognitive Structure and enhances retention of new information through Meaningful Assimilation of Information. This model helps in developing Interest in inquiry and Habit of Precise thinking.

2.7.2 Planning for Advance Organizer Model

In the planning phase the teacher has to create an Advance Organizer. In Ausubel's theory of meaningful verbal learning, an Advance Organizer is a statement preceding a lesson that is designed to preview the material to be learned and link it to content already existing in learner’s schemata. It is more general and abstract than the content to be organized and subsumes the subsequent material. This organizer should be more general, abstract, and inclusive than any of the succeeding material in the text.

In formulation and selection of Advance Organizer one needs to become very familiar with the subject area and conceptualize the discipline as a series of hierarchically organized concepts or propositions. Presentation of Advance Organizer is a distinct teaching episode apart from the usual introduction or transitions that take place in any teaching transaction.
Basically there are three types of organizers. – *Concept Definitions, Generalizations and Analogies.*

**Concept definition:** Definition can be valuable organizers of content when the material is new or unfamiliar. Ideally, the defining statement should possess the characteristics of a good concept definition, in that it states the concept, the superordinate concept and characteristics of the concept. The superordinate concept helps link the concept to existing schemata, and the characteristics differentiate the concept from the other similar ones. The preparation of the organizer requires clear thinking on the part of the teacher. It is general, abstract and inclusive but does not include totally unfamiliar language or ideas. Organizers that are too abstract or unfamiliar lose their ability to link the succeeding structure to the students existing schemata.

**Generalization:** Because of the student’s ability to summarize large amounts of information, generalizations can also be effectively used as Advance Organizers. As with the use of definitions teachers must be certain that the students when using generalizations as Advance Organizers understand each of the concepts in the generalizations. If they are not, these concepts cannot serve as anchors for the new material or link to previously learned content. Thus generalizations could be used as an organizer to subsume narrower generalizations and anchor specific information.

**Analogy:** The most effective type of the Advance Organizer is the analogy. Analogies work well because they can be customized to fit the background of a particular student population. Analogies are useful in organizing school content. The value of an analogy as an Advance Organizer depends on two factors. The first is the familiarity of the analogous element to the students. The power of analogies comes from their ability to connect new ideas with old. If the old ideas are not clear, they cannot provide any firm points for connections. The second factor is the degree of overlap between the analogy and the ideas to be taught. In all the analogies the new material is linked to something familiar to the student and the number of possible similarities between the two concepts being compared.
2.7.3. **Implementation of Advance Organizer Model**

David Ausubel is unusual among the educational theorist. First he directly addresses the goal of learning subject matter. Second he advocates the improvement of presentational method of teaching. Having prepared the Advance Organizer and structured the content in the planning phase of the model, the lesson simply begins by displaying the Advance Organizer on the board or screen. The organizer serves as the lesson’s focus and the point of reference for each of the subsequent ideas.

2.7.3.1. **Syntax of Advance Organizer Model**

Ausubel believed that learning proceeds in a top-down, or deductive manner. In a sequence of learning activities the first organizer and its material should be hierarchically more abstract than succeeding ones, which get more specific and elaborate than the original ones. The activities are designed to increase the clarity and stability of the new material so that fewer ideas are lost confused with one another or left vague. The students should operate on the material as they receive it by relating it with new learning material to personal experience and to their existing cognitive structure and by taking a critical stance towards knowledge. After that students try to gather the information, they and the teacher can ask questions to clarify ideas, add new cultural characteristics from information they found that does not fit the categories, make comparisons across groups, and apply them to new groups. Alternatively, the teacher could present information about a couple of example to develop the ideas further. In either case, the students now have an overall picture of culture that can help them organize information about new groups as they encounter them.

Ausubel's theory consists of three phases, presentation of an Advance Organizer, presentation of learning task or material, and strengthening the cognitive organization.
PHASE ONE

Here, Clarifying the aims of lesson is one way to obtain students attention and to orient them to their learning goals both of which are necessary to facilitate meaningful learning.

Advance Organizer is an idea in itself and like learning material it should be explored intellectually. Actual Advance Organizer is built around the major concepts and propositions of a discipline or area of study. The Advance Organizer has to be constructed so that the learner can perceive it for what it is. It is at a higher level of abstraction and generality than learning material. The essential features of concept or proposition must be pointed out and carefully explained. Teacher and student should explore the organizer by citing essential features, explaining them and providing examples. It should not be lengthy, but must be clearly understood and continually related to learning material to develop integrative cognitive structure. It is especially important to prompt awareness of learner prior knowledge and experience that might be relevant to this learning task and organizer.

PHASE TWO

In this phase, Lectures, Discussions, Films, Experiments or Reading may provide the learning material, which is preceded in the first phase by the Advance Organizer. Maintain students' attention and make the organization of learning material explicit to the students so that they have an overall sense of direction.

PHASE THREE

New material in the students existing cognitive structure is anchored. Learning situation is more interactive in this phase. The successful acquisition of the material will depend on the learners desire to integrate it with prior knowledge on their critical faculty and on the teacher's presentation and organization of the material

Joyce and Weil summarize the basic procedure of the Syntax of Advance Organizer Model as follows
Phase One: Presentation of Advance Organizer

- Clarify aims of the lesson
- Present organizer:
  - Identify defining attributes.
  - Give examples or illustrations where appropriate.
  - Provide context.
  - Repeat.
  - Prompt awareness of learner’s relevant knowledge and experience.

Phase Two: Presentation of Learning Task or Material

- Present material.
- Make logical order of learning material explicit.
- Link material to organizer.

Phase Three: Strengthening Cognitive Organization

- Use principles of integrative reconciliation.
- Elicit critical approach to subject matter.
- Clarify ideas.
- Apply ideas actively (such as by testing them).

2.7.3.2 Principles of reaction

The teacher or the Instructional material controls the situation. The content has been selected for the learner, and the teacher should facilitate the discussion around the material at hand. In the flow of the lesson the training agent can function to point out the conceptual anchorages for the material and help learners see the relationship between the material that is being presented and the organizer.

The teacher’s solicited or unsolicited responses to the learner’s reaction will be guided by the purpose of clarifying the meaning of the new learning material, differentiating it from and reconciling it with existing
knowledge, making it personally relevant to the student and helping to promote a critical approach to knowledge. Ideally students will generate their own questions in response to their own drive for meaning.

2.7.3.3 **Social system**

The social system is a structured one. The teacher is the initiator and the controller of norms. Beyond the presentations of the organizer the learning situation assume a less structured posture and teacher and students can be very interactive. The teacher retains control of the intellectual structure, however as it is necessary to continuously relate the learning material to the organizer and to help students discriminate new material and differentiate it from previous materials.

2.7.3.4 **Support system**

Well-organized material is critical. The effectiveness of Advance Organizer depends on an integral relationship between the conceptual organizer and the rest of the content. The model provides guidelines for building or reorganizing Instructional materials.

2.7.3.5 **Effects of Advance Organizer Model**

Ausubel feels that the continuous use of inquiry-oriented strategies would be very inefficient because it would consume so much time and involve so many false steps. In addition, he feels that if learners are allowed to air their own ideas, many of those ideas will not be efficient. Therefore they will not get the power that is to be derived from the hierarchical structure of discipline. As a consequence, he feels that much learning needs to be organized as reception-learning. He presents the arguments that the reception learning can be very meaningful and should not be confused with rote learning.

The Meaningful Reception Learning – the understanding and integration of new meaning into cognitive structure is the focal point of Ausubel’s theory. Ausubel proposes supplementing meaningful reception learning with a critical approach to subject matter. Ausubel’s method elicits
the learner’s active participation by requiring him to reformulate his own
generalizations and integrate his knowledge in response to carefully
programmed leading question. It is much more structured than discovery
methods.

As far as Piaget’s theory of development is concerned, the children
until ages 10 or 11 would not be able to handle the Ausubel strategy, because
until those age the child is unable to reach the stage of abstract thinking which
is essential to handle complex ideas.

2.7.3.6. Evaluation of effects of Advance Organizer Model

David Ausubel firmly believes in the importance of content goals.
Asking the students to provide additional examples of the concept is a way for
evaluating the acquisition of concepts through the model.

Asking students for recognition or verbal recall of generalization is a
method of evaluating the acquisition of generalization through the model. Use
of generalization to solve a problem or to predict consequences is a
significant mark of the attainment of objectives at the Knowledge and
Comprehension as well as Application levels.

The student’s ability to remember or recall the relationship discussed in
the class is a measure at the knowledge level. An alternative way of
measuring student’s knowledge of relationship is to ask them to identify,
super-ordinate subordinate and coordinate relationship within the developed
hierarchy.

One way of evaluating student’s understanding of relationship at a level
higher than knowledge is to ask them to apply the information learned in class
to a new situation. Another method of evaluating students understanding of
relationship would be to ask the students to write a description of comparison
between concepts. The process skill that can be attained through Ausubel
Model is that of organizing the unstructured information into a hierarchical
structure. Attainment of their goal can be evaluated by testing skill in
organization. This can be done by giving them with an unstructured list of
familiar concepts and asking them to develop an organized diagram of the related concepts.

Ausubel gives many emphases to Instructional and Nurturant effects of Advance Organizer Model. The Instructional value includes the idea themselves that are used as the organizer and information presented to the students. The ability to learn from reading, lectures, and other media used for presentation is another effect. Thus the Instructional effect is the conceptual structures and meaningful assimilation of information and ideas. The Nurturant effect includes interest in inquiry and precise habits of thinking.

A hierarchical classification of behaviour belonging to the Instructional and Nurturant effect will help the user to, more clearly understand the effects of Advance Organizer Model and evaluate it. The classification of Instructional and Nurturant effect of Advance Organizer Model should be in tune with the educational, logical and psychological classification system.

2.8 Detailed Analysis of the Instructional Effect: CONCEPTUAL STRUCTURES

One of the most influential psychologists David Ausubel has stressed the importance of conceptual structures in learning. Concepts are important language symbols used in thinking. It is a symbolic construction that represent some common and general feature or features of many objects or events. Concepts can be thought of as lower or higher order or as form the easily imagined to highly abstract. A concept can be learned when an individual respond to a wide variety of stimuli that belong to same category or classification.

Concept formation is the process of developing concepts. The purpose of concept formation strategy is to induce students to expand the conceptual system with which they process information. Many educationists have made considerable contribution in this area. A detailed analysis of these will help in forming a classification for the Instructional as well as Nurturant effects. This classification helps to give us direction for activity organize and relate classes
or events from cognitive maps, order events and make decision about investigation of meaning.

Hilda Taba designed a model to help students improve their ability to categorize and to use categories. Hilda Taba’s model is an example of concept formation. Here students group examples together on any base and form as many group, as they want. Each group illustrates a different concept. The requirement of concept attainment teaching is minimal; an array of instance or example that are alike in some ways and different in others. A person formulates or reformulate hypothesis about the concept. Each example provides potential information about characteristics and attribute values of concept. In concept attainment there is only one concept. Using clues supplied by the teacher, students try to determine the identity and definition of that concept. The reliance on the same interpretation of the nature of concept is common to both processes.

Hilda Taba suggests that the cognitive task of concept formation involves three major steps:

1. Identifying and enumerating the items of data, which are relevant to a problem. It includes the overt activity –enumeration and listing and covert activity -differentiation
2. Grouping those items according to some basis of similarity It includes the overt activity- Grouping and covert activity -Identifying common properties and abstracting
3. Developing of categories and labels for the groups which includes overt activity- labelling and categorizing and covert activity- determining the hierarchical order of items. i.e. super and sub ordination, Determining the cause effect relationship, going beyond what is given and finding implication and extrapolating.

Hilda Taba suggests a strategy to induce students to expand the conceptual system with which they process information. Each overt activity
elicited by the teaching strategy reflects mental operation that is hidden from view, which Taba refers as covert.

Shirley W. Schiever in “A comprehensive approach to teaching and thinking” suggests that concepts are formed clarified and extended through the following steps of a concept development

1. Enumerate items related to the focus idea
2. Group the listed items in a variety of ways according to perceived similarity or some type of relationship
3. Develop several labels for each group, based on the rationale for grouping
4. Subsume items under different labels and label under other labels by relative inclusiveness
5. Recycle steps 2 through 4 making completely different groups and labels.

According to Schiever the purpose of the concept development task is to assess the level of concept development and to encourage students to discover new relationship as they organize a mass of information. By facilitating assimilation of new information and accommodation of existing cognitive structure, use of concept development strategy makes possible the organization of data or information into meaningful, student determined units or groups. The strategy provides for not only the development but also the organization and reorganization of concepts. In general the strategy helps student develop

a. more openness and flexibility in their thought process
b. a cognitive structure for organizing data and

The purpose of concept formation strategy is to induce students to expand the conceptual system with which they process information. Thus they are required to do something with those data, something that require them to alter or expand their capacity for handling information. In other words they have to
form concepts, which they subsequently can use to handle new information as it comes their way.

Strategy for spontaneously teaching concepts as suggested by Donald P Kauchak and Paul D Eggen is

1. Link to superordinate concept
2. Compare to coordinate concept
3. Identify characteristics
4. Present non examples
5. Analyze context

The NCTM (National Council for Teachers of Mathematics) curriculum and evaluation gives the following standards for evaluating concepts. The assessment of student’s knowledge and understanding of mathematical concepts should provide evidence that they can

1. Label, verbalize and define concepts
2. Identify and generate examples and non examples
3. Use models diagrams and symbols to represent concepts
4. Translate from one mode of representation to another
5. Recognize the various meanings and interpretation of concepts
6. Identify properties of a given concepts and recognize conditions that determine a particular concept
7. Compare and contrast concepts

In addition, assessment should provide evidence of the extent to which students have integrated their knowledge of various concepts.

Jerome S. Bruner, the famous Harvard cognitive psychologist, emphasizes in his theory the importance of attainment of concepts by the individual for his cognitive development. He has made numerous studies to find out the process of concept formation. The process of concept attainment involves the search for and listing of attributes that can be used to distinguish exemplars from non-exemplars of various categories, Bruner stresses that the
purpose and emphasis concept formation and concept attainment are
different. Concept formation is the act by which new categories are formed; it
is an act of invention. The process of concept attainment involves the search
for and listing of attributes that can be used to distinguish exemplars from
non-exemplars of various categories.

In short, in concept attainment concept already exists. Concept
formation is the act of invention according to Bruner categorizing activity
actually has two components. –The act of concept formation and the act of
concept attainment. Concept formation is the first step towards concept
attainment. The requirement of concept attainment teaching is minimal. An
array of instances or examples that is alike in some ways and different in
others. A person encounters these examples and formulates or reformulates a
hypothesis about a concept. These examples provide potential information
about the characteristic and attribute value of the concept. Child correctly
distinguish example from non-example. Then verbalize the attributes of
concept.

Bruner sees any concept as having five elements -, Name, Example,
Attribute, Attribute value and Rule. Understanding a concept implies knowing
all these elements. Another of Bruner’s assumption is that some strategies for
forming concepts or categorizing are more effective than others. Bruner used
the term strategy to refer to the sequence of decision that people make as
they encounter each instances of concept.

According to Bruner, conceptualizing process includes understanding
the relationship among data examples, attributes and concept and the
thinking patterns that are used to attain the concept. Bruner stressed that the
learner should be active in the process of knowledge acquisition. He selects
and transforms information, formulates hypothesis and alters hypothesis if
needed in the light of evidences. Thus a person actively constructs his
knowledge by relating new information to previously existing cognitive
structure. The manner in which a concept is made an integral part of the
learner’s cognitive structure shows how far that concept is internalized by him.
Bruner’s theory is centred around the three levels of learning – enactive, iconic and symbolic corresponding to manipulation of material, dealing with mental images and manipulation of symbols respectively.

The six characteristics that can be observed in the learner while passing through different stages of intellectual development enunciated by Bruner are of much importance. The important characteristics are

1. Independence of response from stimulus
2. Internalizing event through mental representations
3. Expression of ideas
4. Relationship between teacher and learner
5. Language as medium of exchange
6. Increasing capacity to deal with different activities simultaneously.

Bruner advises that the learners should discover meaning for themselves and the teacher should enable them to learn concept in the language they understand. He points out that the function of school is not to create little walking libraries. Rather it should develop in the pupil the ability to analyze the situation properly, develop concepts and apply them for discovering solutions to new problem. The instructor has to teach his learner how to learn.

Like Bruner, Ausubel believes that the structural concepts of each discipline can be identified and taught to students, which then become an information processing system for them. They become an intellectual map that students can use to analyze particular domains and to solve problems within those domains.

Ausubel describes the mind as an information processing and information storing system that can be compared to the conceptual structure of an academic discipline. Like the discipline mind is a hierarchically organized set of ideas that provide anchors for information and ideas that serves as a storehouse for them. As this information processing system
acquires new information and new ideas it reorganizes itself to accommodate these ideas. Thus the system is in a continuous state of change.

According to Ausubel there is a parallel between the way subject matter is organized and the way the people organize knowledge in their cognitive structure. He expresses the view that each of the academic has a structure of concepts that are organized hierarchically. At the top of discipline are a number of very broad, abstract concepts that include the more concrete concepts at lower stages of organization.

Synthesizing the above said existing information it can be concluded that the development of conceptual structures involves the following major components.

1. Listing
2. Grouping
3. Labelling
4. Subsuming
5. Recycling

RATIONALE FOR INDIVIDUAL STEP

LISTING:

The information one gathers from the environment need not be in an organized form. This data can be made meaningful through the process of listing. Listing a variety of data related to a specific topic helps develop the skill of determining relevancy and give student a base of information that includes many new ideas since the group pool its thinking. Additionally the pooling of knowledge provides all the students with a common base of data.

The teacher’s role at the listing step

1. to focus on data relevant to the purpose of discussion
2. to require specific data
3. to seek clarification and example of data when appropriate
4. to record specific items
5. to seek a variety of data
6. to limit the length of list and amount of time spent at this step.

Thus, in the first step, the students will enumerate specific human behaviour that reflects prejudice. Here the teacher’s role is to focus on specific relevant data, record data, limit list length time spent on step, and seek variety. Support procedure that can be adopted are list data on BB, seek clarification and variety as necessary, Review list of data before beginning next step.

**GROUPING:**

The data can be grouped based on similarities or relationships. Identifying common attributes and relationships between and among items is essential for this process. Each learner gets a chance of observing the groups made by others which in turn helps to expand his view of how items are similar and different (assimilation of ideas) Grouping process promotes the identification of multiple attribute, stimulates a flexibility openness to different thinking style (accommodation) and creates a respect for the ideas of others.

Verbalizing reason for grouping
1. helps learners clarify their reasoning for themselves and others
2. allow other learners to add to a group made by someone else
3. enables teachers to understand the students cognitive structure

The role of teacher is
1. to seek groups formed for a variety of reason
2. to require support for the basis of grouping
3. to listen to determine level and type of classification schema
4. to designate the groups formed by marking in some way

To conclude, in the second step, students will group data based on common attributes or other relationship and students will provide reason for this grouping. Here the teacher's role is to mark groups that student form and
seek support. Support procedures that can be adopted are to listen to responses to determine type of groups being made and relationship seen.

LABELLING:

It is an abstracting or synthesizing process where the learner has to express the relationship or commonality among the item, through a word or phrase, which conveys the essence of the basis for grouping. A label symbolizes all the items sharing the relationship or common attributes. The act of labelling will result in developing vocabulary and creativity.

The role of teacher is

1. to establish a link between label and the relationship of items in a group through focus question
2. to require verbalization of this link through the support question
3. to require support for label that does not include the label itself
4. to encourage group interaction regarding appropriateness or inappropriateness of data
5. to seek a variety of labels for each group
6. to record the labels, noting with number or symbol to which group the labels belong.

Thus, in the third step, students will suggest appropriate label for grouped item and state reason for the label are (or are not) appropriate. Here the teacher’s role is to seek at least three labels for each group, record label and seek support. Support procedures that can be adopted are listening to responses watch for opportunities for student interaction.

SUBSUMING:

To subsume means to classify within a large category or under a general principle. The cognitive task of subsuming requires and develops further an awareness of a hierarchical system of super and subordination in which lower order items are subsumed under items of a higher order of generality. In the concept development task, the purpose of subsuming items
under different labels is to explore new relationship of the data and labels. This process makes learners efficient thinkers. Learning to subsume helps students develop the concept of inclusiveness and helps them deal more competently with ideas.

There are two separate and distinct subsumption tasks.

First of all learner has to subsume

a. Items that are not under a label or under existing labels
b. Items now under one label and under a different label.

While doing so, the learner could see new relationship among the data, in addition to those already noted and interrelationship among data and among labels. Second task is that of subsuming labels under other, or inclusive labels. It makes clear that some labels are more general and broader than others and that relationship and interrelationship exist between data and labels. This helps the learner to organize data, construct sentence, select main ideas and make generalization.

Role of teacher

1. to make the task clear through the initial focus questions and /or an example if necessary
2. to encourage flexibility of thinking
3. to encourage student interaction regarding similar or very different subsumption
4. to note student ability/inability to grasp the concept of subsumption

In the fourth step, students will subsume listed behaviour under more than one label and labels under inclusive labels. And will give reason for subsumption. Here the teacher’s role is to delineate task clearly and encourage flexibility. Support procedures that can be adopted are to write subsumed label in outlined form, to allow time for thinking and model variety of question stems
RECYCLING:

Recycling promotes openness and flexibility in thinking. Steps two to four are completely recycled.

1. It gives an opportunity to see new relationship among data
2. An opportunity to build on previous ideas, coming up with other ideas that are more or less obvious
3. The revelation that different ways of grouping data can help achieve different purposes
4. Promoting the idea that new ways to look at the same data and new relationship always can be found

In the fifth step, students will form new groups for different reason, label the new groups and subsume items and labels under labels. Student will also give support for new groups new labels and new subsumption. Here the teacher's role is as the same as step two, three and four and encourage discovery of new relationship. Support procedures that can be adopted are same as the steps two three and four and erase groups and labels that were made previously.

2.9 Detailed Analysis of the Instructional Effect: MEANINGFUL ASSIMILATION OF INFORMATION AND IDEAS

According to Ausubel, “the art and science of presenting ideas and information meaningfully and effectively so that clear stable and unambiguous meaning emerge and retained over a long period of time as an organized body of knowledge is really the principal function of pedagogy.” Ausubel also places heavy emphasis on Meaningful verbal learning, that is, the acquisition of information that has several links to other ideas.

According to Ausubel, whether material is meaningful depends on the learner and the material and not the method of presentation. If the learner begins with right set and if the material is potentially understandable then meaningful learning can occur. The key to meaning involves solidly connecting the new learning material with existing ideas in the learner’s
cognitive structure. A meaningful learning set implies that the learner must be ready to comprehend and relate what is being presented, rather than to memorize it verbatim. Meaningful learning can occur when learner struggle with the material looking at it from different angles, reconciling it with similar or perhaps contradictory information and finally translating it into his or her own frame of reference and terminology. Each of these mental activities increases the meaning and internalization of new information. Ausubel assumes that for meaningful verbal learning to occur the learner plays an active role whether covert or overt. The teaching model for reception learning must be designed to facilitate these active mental operations.

As Ausubel points out, one of the real problems for teachers is that most textbooks and other teaching materials are not organized progressively. Each topic is, instead, given a separate section of the text and treated at about the same level of abstraction. Seldom, if ever, does the learner get to see the overall structure of the subject matter under study in a way that is related to his/her previous experience.

Ausubel’s theory of meaningful verbal learning deals with three concerns:

1. How knowledge is organized (Curriculum content)
2. How the mind works to process new information (Learning)
3. How teachers can apply these ideas about curriculum and learning when they present new materials to students. (Instruction)

The teacher is responsible for presenting what is to be learned. The learner’s primary role is to master ideas and information. Ausubel maintains that new ideas can be usefully learned and retained only to the extent that they can be related to already available concepts or propositions that provide ideational anchors. If the new material conflicts too strongly with the existing cognitive structure or is so unrelated that no linkage is provided the information or ideas may not be incorporated or retained. To prevent this from occurring, the teacher must organize a sequence of knowledge and present it in such a way that the ideational anchors are provided. In addition the learner
must actively reflect on the new material thinking through these linkage reconciling differences or discrepancies with existing information and noting similarities.

It must be remembered that both the discipline and the sequence of instruction are built from the top down with the most inclusive concepts principles or proposition presented first. The job of facilitating Meaningful Verbal Learning and Retention has two aspects.

1. Development of appropriate strategies to increase the clarity and stability of learning material or preferably of the ideas in the cognitive structure

2. Supplement or integrate with this teaching model that facilitate a critical approach to subject matter

The theory of Meaningful Verbal Learning applies to situation where the teacher plays the role of lecturer or explainer. The main purpose is to help students acquire subject matter.

All Individuals deals with lot of information in the day-to-day life. All these information need not be remembered as such. They are more likely to remember the meaning of what they see or hear than precise word for word detail. Many theorists like Anderson (1976,1983,1985), Ellis and Hunt (1983) and Gagne (1985), believe that meanings are stored as propositions, that is, as small units of knowledge concerning relationship among objects or events. An experiment conducted by Turnure, Buium and Tharlow (1976), lead to the conclusion that, children processed the information in one of the different ways mentioned below.

1. Labels: They repeated the name of objects.

2. Sentence generation: They made up sentences that included both objects in a pair.

3. Sentence repetition: They repeated experimenter generated sentences, in which a relationship between the two objects was stated.
4. What Question: They answered a question about a relationship between the objects.

5. Why question: They answered a question concerning why a particular relationship existed between the objects.

Ausubel emphasizes that in learning, meaningful process is essential. Material has to relate to established ideas in the cognitive structure of the learner in terms of ideas, which enable the material to be learned in a logically coherent way. In order to accomplish this, the learner needs access during the learning process to set of ideas that can subsume the new material to be learned and which by being incorporated into the cognitive structure of the learner, provide him with anchors for the new material.

A great deal of information thus received by the individual is stored primarily in terms of underlying meaning. Nonverbal visual information also appears to be stored at least partly in terms of meaning (Mandler and Johnson, 1976, Mandler and Parker, 1976 and Mandler and Ritchey, 1977).

According to Anderson (1985) the meaning of the information people receives endures far longer, than either, verbal or visual information. If this is so, educators who are concerned, that their students remember information over long periods of time, should help students focus on the underlying meaning of that information.

The meaningful reception learning – the understanding and integration of new meaning into cognitive structure is the focal point of Ausubel's theory. Ausubel proposes supplementing meaningful reception learning with a critical approach to subject matter. Ausubel's method elicits the learner's active participation by requiring him to reformulate his own generalizations and integrate his knowledge in response to carefully programmed leading question. It is much more structured than discovery methods.

Advance Organizer Model can be applied to any material, which can be organized intellectually. It can be used in nearly every subject area, although it was designed for use with verbal material rather than with skills and mastery
of problem solving paradigms. However, Ausubel assumes that it will be useful in the transfer of material to new problem settings. It provides a very good discipline for lectures. It can serve very well in the analysis of expository material in textbooks and other Instructional material where abstractions and information alternate in various patterns.

David Ausubel is a psychologist who advanced a theory, which contrasted meaningful learning from rote learning. In Ausubel's view, to learn meaningfully, students must relate new knowledge (concepts and propositions) to what they already know. Ausubel feels that the continuous use of inquiry-oriented strategies would be very inefficient because it would consume so much time and involve so many false steps. In addition, he feels that if learners are allowed to air their own ideas, many of those ideas will not be efficient. Therefore they will not get the power that is to be derived from the hierarchical structure of discipline. As a consequence, he feels that much learning needs to be organized as reception learning that is in situation where the learner is the receiver of information and ideas. He presents the arguments that the reception learning can be very meaningful and should not be confused with rote learning. Rote learning places emphasis on the memorization of specific items of information at the expense of students exploring relationships within the material. Meaningful learning occurs when the ideas in a new schema are connected not only to each other but also to previously established schemata in a logical manner.
Table 2.1

Characteristics of Meaningful Learning and Rote Learning

<table>
<thead>
<tr>
<th>Meaningful Learning</th>
<th>Rote Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-arbitrary, non-verbatim, substantive incorporation of new knowledge into</td>
<td>Arbitrary, verbatim, non-substantive incorporation of new knowledge into</td>
</tr>
<tr>
<td>cognitive structure.</td>
<td>cognitive structure.</td>
</tr>
<tr>
<td>Deliberate effort to link new knowledge with higher order concepts in cognitive</td>
<td>No effort to integrate new knowledge with existing concepts in cognitive</td>
</tr>
<tr>
<td>structure</td>
<td>structure.</td>
</tr>
<tr>
<td>Learning related to experiences with events or objects.</td>
<td>Learning not related to experience with events or objects.</td>
</tr>
<tr>
<td>Affective commitment to relate new knowledge to prior learning.</td>
<td>No affective commitment to relate new knowledge to prior learning.</td>
</tr>
</tbody>
</table>

Learning information primarily through repetition is sometimes called rote learning (Ausubel 1963, 1968; Ausubel, Novark and Hanesian 1978; & Ausubel and Robinson 1969). On rote learning there is little or no attempt to make the information meaningful or to understand it in terms of things one already knows. If such information is stored in long-term memory at all it is not stored in association with similar information but instead in relatively unconnected and isolated. Information stored in the unorganized fashion becomes difficult to retrieve. Three processes of effective long-term memory storage are

1. Meaningful Learning
2. Organization
3. Elaboration

RETENTION

People are more likely to remember the meaning of what they see or hear than precise word. Many learning theorist (Anderson 1976,1983 and
1985, Ellis and Hunt 1983, and Gagne 1985) believe that meaning are stored as small units of knowledge concerning relationship among objects or events. Retrieval of information from long-term memory depends to some extent on whether the information was well organized when first stored. Retrieval is more effective when information is stored in close association with one another. Retrieval cues are hints that are associated frequently with information an individual is trying to remember. Retrieval cues definitely aid recall of information. The environmental context in which information was originally learned can often provide an effective retrieval cue.

A great deal of information individual receive is stored primarily in terms of underlying meanings. Nonverbal, visual information also appears to be stored at least partly in terms of meanings, (Mandler and Johnson, 1976; Mandler and Parker, 1976; & Mandler and Ritchey, 1977). According to Anderson (1985), the meaning of the information people receive endures far longer than either verbal or visual information. If this is so, educators who are concerned that their students remember information over long periods of time should help students focus on the underlying meaning of that information.

Meaningful learning is a process of associating new information with existing information in long term memory this associational process is accomplished using a hierarchical model of long-term memory organization. Meaningful learning is a process of placing or subsuming new information under an appropriate super ordinate category (Ausubel 1963,1968; Ausubel, Teal, 1978; & Ausubel and Robinson 1969)

For learning to be meaningful, the minds of the learner should be made active. They should be made active. They should be able to relate material to their own cognitive structure. Ausubel speaks about the learners struggle with the material- looking at it from different angles, reconciling it with similar or perhaps contradictory information and finally translating it into their own frame of reference and terminology.
Ausubel as well as other authors have stressed the need to satisfy certain conditions to make learning meaningful. In their view meaningful learning occurs if

1. the learner has a meaningful learning set
2. the learner has previous knowledge to which information can be related.
3. The learner is aware that a piece of previously learned information is related to a new piece of information and has both pieces of short-term memory at the same time.

Some principles related to long-term memory and retrieval processes are particularly applicable to classroom learning.

1. Meaningful learning should be emphasized over rote learning. Meaningful learning leads to more rapid storage and more successful retrieval than rote learning
2. To learn new material meaningfully students must have knowledge and experiences to which that material can be related and they must see how that material relates to what they already know.
3. New material should be appropriately organized.
4. Students should be encouraged to elaborate on new information, but that elaboration should be monitored for appropriateness and accuracy.
5. Students should store information with retrieval in mind.
6. Students memories will probably never be totally reliable records of information

H.R. Mills suggests several factors which affect the ease with which one assimilate and remembers.
FACTOR                  NOTES FOR INSTRUCTOR
1. Meaning and understanding make meaning clear, use simple words
2. Interest and attention motivate the class
3. Depth of impression be impressive, use surprise, curiosity, aids
4. Association of ideas good sequence, logical development, humour, surprise
5. Frequency of repetition especially applicable to disconnected facts to confirm
6. Time regular and systematic revision and lists with quick feedback
7. Frequency of recall class should give back from time to time, use tests, assessment

Synthesizing the above said existing information it can concluded that the meaningful assimilation of information involves the following major components.

1. Linking
2. storage
3. organization
4. elaboration

LINKING

The learner must approach new information with the attitude that it can be meaningfully understood (Ausubel et al., 1978). This attitude is more likely to be present in the students when teachers emphasize meaning rather than verbatim recitation (Ausubel et al., 1978). A meaning to new information can be obtained by relating it to knowledge already stored in long term memories. Hence this process is most frequently known as meaningful learning. According to Ausubel, whether or not material is meaningful depends more on the preparation of the learner and on the organization of the material. If the
learner begins with the `right set' and if the material is solidly organized, then meaningful learning can occur.

Meaningful learning can occur if the new information can be associated with existing information (Ellis and Hunt, 1983; Johnson, 1975). Most important factors affecting long term memory storage is what the individual already knows (Ausubel et al., 1978; Ausubel and Robinson, 1969). Individual who have a large body of information already stored in long term memory possess more ideas to which they can relate new experiences and so can more easily learn at a meaningful level. The importance of previous knowledge for learning new information has been illustrated in numerous studies (Chase and Simpson, 1973; Cheesy Spilich and Voss, 1979; Degroot, 1965; Ormrod, Wagner and Mccallin, 1988; Saxe, Resonder and Voss, 1979). The more closely learners can relate new material not only to previously learned information but also to themselves and their own personal experience the more effective meaningful learning is likely to be.

Ausubel suggests, "If I had to reduce all of educational psychology to just one principle, I would say this the most important single factor influencing learning is what the learner already knows, ascertain this and teach him accordingly.” Piaget presents similar idea through the processes of assimilation and accommodation, and that of disequilibrium as a prerequisite for encouraging thinking / learning. Bruner stresses on curiosity for effective learning.

STORAGE

When information is learned meaningfully, it is stored in long-term memory in association with similar, related pieces of information. Meaningful learning appears to facilitate both storage and retrieval. This information goes in more quickly and is remembered more easily. Non-verbal material is also, more easily stored when it can be meaningfully understood.

By relating new information to knowledge already stored in long-term memory, people find a meaning in that information. Hence this process is
most frequently known as meaningful learning. When information is learned meaningfully it is stored in long-term memory in association with similar related priced of information.

The individual must know that the new information is related to something already in long term memory (Ausubel, 1963, 1968; Ausubel and Robinson, 1969). The relevant information in long term memory must also be retrieved to short term memory to allow for the integration of the new information with it (Gagne and Driscoll, 1988).

**ORGANIZATION**

Ausubel stresses that the learning material should be solidly organized when meaningful learning occurs. A body of new information to be learned is stored, more effectively and remembered more completely when it is organized. In fact people seem to have a natural tendency to organize and integrate the information they receive.

Materials that is presented in an unorganized fashion is more difficult to learn than clearly organized, material. Experiment conducted by Bower Clark and Winzing (1969) demonstrates just how significant organization can be. Meaningful learning allows new information to be organized with previously learned information. This process is external organization. Process of organization of a new body of information within itself is internal organization (Gagne, 1985).

The proper organization and structuring of the material to be learnt indicates that the instruction has been planned effectively by the teacher. It is easier for a student to learn organized material than unorganized. Logical relationship exists among major ideas and concepts in the different parts of lesson. A well-structured lesson helps the student in understanding and remembering the lesson. What is learnt should be meaningfully linked with and new material must fit in with what was previously learnt. A student is then able to use the relationship between the new and the old.
Ausubel stresses that the learning material should be solidly organized when meaningful learning occurs. A body of new information to be learned is stored, more effectively and remembered more completely when it is organized. In fact, people seem to have a natural tendency to organize and integrate the information they receive.

Meaningful learning is a process of associating new information with existing information in long-term memory. This associational process is accomplished using a hierarchical model of long-term memory organization. Meaningful learning can be regarded as being a process of placing or subsuming, new information under an appropriate superordinate category (Ausubel, 1963, 1968, Ausubel et al., 1978, Ausubel and Robinson, 1969).

Teachers can facilitate students learning by pointing out the kinds of knowledge that can use to understand new material. Meaningful learning allows new information to be organized with previously learned information the process is therefore sometimes referred to as external organization (Gagne, 1985). Another equally important process is the organization of a new body of information within itself. That is internal organization. A body of new information to be learned is stored more effectively and remembered more completely when it is organized. In fact, people seem to have a natural tendency to organize and integrate the information they receive. A material that is presented in an unorganized fashion is more difficult to learn that clearly organized material.

ELABORATION

When individuals receive new information, they often use what they have already learned about the world to help them understand that information or to learn meaningfully. Sometimes, new information is incomplete and missing pieces need to be filled in. When new information resembles previous experiences and events, then assumptions, interpretations and inferences drawn from those previous events are likely to be imposed on the new information and learned right along with it. Elaboration then is a process of learning more than the information actually presented.
Learning theorists have come to several conclusions about the factors involved in elaboration.

1. Elaboration is a constructive process of using both new information and one’s existing knowledge about the world to construct a meaningful interpretative of that new information.

2. Jean Piaget used the concept of schema to refer to a mental unit representing a class of similar actions of thoughts. In contemporary cognitive theory the term schema usually refers to an organized body of knowledge about a specific topic. People often form schemas about events as well as objects. An individual’s mental script of an event will influence what information is learned from a given instance of that event. Human memory system is typically confronted with more information than it can possibly handle. A schema provides a means by which people can focus their attention on information that is likely to be important and to ignore what is probably unimportant. Schemas also enable people to make sense out of an incomplete set of information (Posner, 1978).

3. People elaborate the same information in different ways depending on their previous experience and their expectation about the new information.

4. When people use previously acquired facts and beliefs to elaborate new information, they may alter the new information erroneously. Teachers often present information to students thinking that their erroneous beliefs will be corrected. Through the processes of meaningful learning and elaboration the new information will be related to altered fit students preconceived notions about the world. As a result students learn inaccurate rather than accurate information.

5. Elaborated information is more effectively learned and remembered than non-elaborated information. Students should be instructed about
the benefits of elaboration when they study. Elaboration appears to be especially effective when it helps to tie new information together. Elaboration facilitates long-term memory for several reasons.

1. Elaborated information may be less likely to be confused with other similar information stored in long term memory.
2. Elaboration may provide additional means through which information can later be retrieved.
3. Elaboration may help with inferences about what the information was likely to have been, when information itself cannot be accurately recalled.

Students should be instructed to study strategies that use meaningful learning, organization and elaboration processes. For instance they can be taught to state ideas in their own words, generate their own examples of ideas, make connections between new concept and their own past experiences and draw logical inferences from the data they are given.

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1. Elaboration is a form of construction.
2. Elaboration frequently involves use of schemas
3. Different individuals elaborate the same information in different ways and accordingly learn different things
4. Elaboration sometimes leads to the storage of distorted or erroneous information

5. Elaboration usually leads to better retention of information.

2.10 **Detailed Analysis of the Nurturant Effect: INTEREST IN INQUIRY**

Formation of conceptual structures and meaningful assimilation of ideas leads to the development of interest in inquiry. At this point of learning more about the interest in inquiry, the process of inquiry and the skills inherent within it was considered to be very important. In the broadest sense, interest in inquiry can be viewed as interest shown in a systematic way to investigate a question or a problem. Interest in inquiry is very essential to generate and validate knowledge. Interest in inquiry at the most fundamental level can be viewed as an interest which individual attempts in the process for answering and solving problems based on facts and observation.

Ausubel's idea of interest in inquiry very much coincides with the idea presented by Paul D. Eggen and David P. Kauchack in Strategy for Teachers. According to their view, any teaching strategy which promotes inquiry spirit should proceed through five major steps of questions or problem identification, hypothesis generation, data gathering, assessment of hypothesis through data analysis and generalizing.

As far as mathematics teaching is concerned in a classroom level, interest in inquiry implies the interest a student exhibits in attacking questions and identifying problems encountered in various content areas. Students who have interest in inquiry will investigate real question and problem through data gathering by generating hypothesis. Student will also arrive at a generalization through analyzing and assessing data. At this juncture, work of Richard Suchman (1966) is to be thought of, as it is in tune with this idea.

Most of the inquiry process includes identification of cause and effect relationship or investigation of relationship between concepts that are not necessarily casually linked. Success of this depends on students' ability to, recognize problems, suggest tentative answers, identify and gather relevant
facts and critically assess the tentative solutions. These can be identified as various skills of inquiry (Eggen) once the cause effect or correlation relationship identified the next task are to prepare a question or problem that relates to this relationship. In order for the investigation to successfully precede the next step is to anticipate a procedure for gathering data, which is designed to answer the question or solve the problem. A student who exhibits all the ability can be thought of as having an interest in inquiry. It is to be noted that a matter of organization, which includes sequencing, and scheduling of events in clear terms helps to smoothen the inquiry process.

Synthesizing the above said facts it can be concluded that Interest in Inquiry includes the five factors

1. Questions or problem identification
2. Hypothesis generation
3. Data gathering
4. Assessment of hypothesis through data analysis
5. Generalizing

**Question and Problem Identification**

The one who have an interest in inquiry will display a tendency of questioning and problem identification. Obviously there are a variety of ways in which questions can be asked but the matter is that how good they formulate question to make the problem really communicable. Interest in inquiry can be observed in the structural way of attacking a question. It will be made evident through posing a series of questions that encourage a student to move from a question to hypotheses to data gathering and the subsequent analysis of these data.

**Hypothesising**

Once the questions or problem is clarified, the next step in the process is an effort made to answer or solve the problem. A student who has further interest will exhibit a tendency to provide a tentative answer through a
process of hypothesizing. A hypothesis is an unverified generalization. After forming hypothesis they are prioritized for the purpose of investigation.

**Data Gathering**

The generated hypothesis is then used by those who have further interest in inquiry to guide data gathering procedures. The complexity of process depends on the problem. At times it may be simple and straightforward. Data are of two types – primary and secondary. Primary data source come from student’s gathering original data. It requires more time and cost. Secondary source include textbook, encyclopaedia, and other references in which the information has already been analyzed and interpreted by others. If primary data is not available it is possible to gather data from secondary sources.

**Data Analysis**

Assessing of hypotheses on the basis of data is the next phase shown by those who have interest in inquiry. If the data appears to be fairly simple the analysis process does not require a great deal of effort. If the process is more complex, then quantitative investigations, data tables, and graphing may be needed in order to use the data effectively. At this point, student may formulate hypothesis as tentative investigative guides. Effective way to deal with the problem is to sequentially analyze and interpret data before turning back to hypothesis. If the data do not support a hypothesis, the tendency is to describe the hypothesis as ‘wrong’. At the time the hypothesis was proposed, it was the most appropriate answer based on the available information. But, added data may require that the hypothesis be subsequently rejected about the matter of right or wrong should never be an issue.

**Generalising**

In the final step of inquiry process acceptance, rejection or modification of hypothesis is made to arrive at a tentative generalization on the basis of this conclusion. The generalizing process may then lead to new question and inquiry process moves forward.
Those who have interest in inquiry go through all these states continually in the real world. One of the greatest benefits in the study of inquiry is a heightened awareness of the possibilities of conducting inquiry investigations that occur spontaneously.

2.11 Detailed Analysis of The Nurturant Effect: HABIT OF PRECISE THINKING

The New Lexicon Webster’s Dictionary defines habit as a tendency to repeat an act again and again, a behavioural pattern that has a degree of automatism. The International Dictionary of Education suggests meaning of habit as practiced, automatic learned responses which are spontaneous in response to certain situation and which meet needs in the individual. The Concise Oxford Dictionary put meaning of habit as a settled or regular tendency or practice or a practice that is hard to give up.

The New Lexicon Webster’s Dictionary suggests the meaning of precise as accurate in every detail. The Concise Oxford Dictionary put meaning of precise as accurately expressed or definite.

The New Lexicon Webster’s Dictionary defines the meaning of thinking as to engage in the process of arranging ideas in a pattern of relationship or of adding new ideas soon to be related to such a pattern, to conceive in mind to bring a specified condition of mental activity. The New Webster’s Dictionary defines thinking as to engage in the process of arranging ideas in a pattern of relationship or of adding new ideas so on as to be related to such a pattern. According to The International Dictionary of Education it is creation of order in the perceived world of objects and representation of objects. Personality attitudes and emotions influence thinking.

Hilda Taba identified three postulates about thinking

1. Thinking can be taught.
2. Thinking is an active interaction between the individual and data. This means that in the classroom setting the material of instruction become available to the individual when he performs certain cognitive operation upon them – organizing facts into conceptual system, relating points in
data to each other and generalizing upon these relationship making inferences and using known facts in generalization to hypothesize, predict and explain unfamiliar phenomena. The teacher can assist the processes of internalization and conceptualization by stimulating the students to perform complex mental processes and offer progressively less and less direct support.

3. The processes of thought evolve by a sequence, which is lawful. In order to master certain thinking skills one has to master certain other earlier ones and that this sequence could not be reversed.

Thinking and thinking skills are not synonymous. Thinking is the mental manipulation of sensory input and recalled perceptions to make or find meaning – to reason about or with to formulate thoughts and to judge. Thinking skills are the discrete, precisely delineated mental operations used in varying combinations as we think. The current literature defines thinking in terms of distinct skills that include basic thinking skills - observe, compare, contrast and reflect; high level thinking skills – creative and critical thinking, analysis, synthesis and evaluation; and complex thought processes – decision-making, problem solving and the scientific method of investigation.

Students make use of thinking skills to make learning concepts and other forms of content more thorough and efficient. The various dimensions of thinking process are domain specific knowledge, basic processes, metacognition, attitude and dispositions.

Domain Specific Knowledge

Domain specific knowledge refers to knowledge in a specific content area. During the process of thinking basic process are applied to some content area or domain. This domain specific knowledge provides a content area in which basic process can be applied. To think effectively students must know when different processes can be applied. Nickerson (1988) stresses that to think effectively in any domain one must know something about that domain. The Domain specific knowledge refers to knowledge in a particular
content area. Teachers accommodate domain specific knowledge when they teach both content and thinking skills during their lesson.

**Basic Processes**

Basic processes are the intellectual skills involved in thinking. Basic processes are fundamental constituents or building blocks of thinking. They are the thinking tools used to transform and evaluate information. They include processes like observing, comparing, contrasting inferring and predicting. While experts label these basic processes in different ways using terms such as information processing skills (Eyer, 1988). Core thinking skills (Marzano et al., 1989) or essential cognitive processes most include the processes summarized below.

**Basic processes of thinking**

<table>
<thead>
<tr>
<th>Process</th>
<th>Sub-processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observing</td>
<td>Recalling, Recognizing</td>
</tr>
<tr>
<td>Finding patterns and generalizing</td>
<td>comparing and contrasting,</td>
</tr>
<tr>
<td></td>
<td>Classifying, Identifying relevant and</td>
</tr>
<tr>
<td></td>
<td>irrelevant information</td>
</tr>
<tr>
<td>Finding conclusion based on pattern</td>
<td>Inferring predicting, Hypothesizing, applying</td>
</tr>
<tr>
<td>Assessing conclusion based on</td>
<td>checking consistency, identifying bias</td>
</tr>
<tr>
<td>Observation</td>
<td>identifying unstated assumptions,</td>
</tr>
<tr>
<td>Thinking critically</td>
<td>recognizing over/ under generalization</td>
</tr>
<tr>
<td></td>
<td>Confirming conclusion with facts</td>
</tr>
</tbody>
</table>

**Metacognition**

Awareness and regulation of our own thinking is described as Metacognition. Metacognition is individual’s awareness of their own thinking. Metacognition has also come to connote the management of one’s own cognitive resources and the monitoring and evaluation of one’s intellectual performance (Nickerson, 1988). Students should know when they are using basic processes, what processes they are using how they relate to the content they
are learning and why they are being used. To develop thinking abilities Mc.Tighe (1987) describe three complementary approaches. Teaching for thinking accounts to involving students in thinking as they learn content. Teaching of thinking utilizes a direct teaching strategy whereby a specific thinking skill such as comparing, becomes the content of the lesson. and Teaching about thinking helps make students become more aware of their own learning and thinking. Talking and teaching about thinking can help students become more efficient and better self-directed learners. Researches in the area of metacognition indicates that these abilities can be taught (Gavelk, J., and Raphael, T., 1985)

**Attitudes And Dispositions**

Our attitudes and dispositions influence our inclinations to use thinking as a way of acquiring and confirming understanding. Effective thinking requires willingness on the part of students to use basic processes in different content area and in their everyday lives without positive attitude thinking skills, remain unused in students mind. To be valuable thinking skill must not only be learned but also used. Learners’ awareness and understanding of processes and strategies they are using, will lead to the dispositions or inclination, to use them spontaneously. Example of attitude and disposition include inquiry spirit, fair mindedness, openness to evidence on any issue respect for opinion that differ from one’s own inquisitiveness and a desire to be informed, a tendency to reflect before acting and numerous others

Different inquiry strategies provide students with opportunities to use and practice thinking skills through the processes of hypothesis generation data gathering and data analysis.

All teachers teach thinking skills but not all teachers do it well. Students need to learn to think because the ability to think through ideas is as important as ideas themselves and classrooms should play a major role in this area of development. As with other areas of curriculum, effective teachers can have a considerable impact on students helping them develop and refine their
thinking abilities. To do this, teachers must understand what thinking skills are, how they are learned and what they can do to develop them.

Thinking skills are context free, open-ended sequential cognitive processes that allow students to transform information in a strategic manner. There are two approaches for teaching thinking skills – explicit thinking skills instruction and complementary skills instruction. In the first case teacher identifies skill acquisition as a primary goal and teacher toward that goal in a direct manner. Content become a vehicle to teach the thinking skill. In complementary skill instruction content goals become, more important and the need to develop lesson momentum organization and continuity are real thinking skills are still taught but these are complementary to the content vector of the lesson.

Principles of teaching thinking are listed below (Pressley et al., 1990).

1. Target specific thinking skills and teach them intensively
2. Model and talk about thinking skills
3. Explain where and when to use different thinking skills
4. Reinforce thinking skills
5. Develop student motivation to use thinking skills

Synthesizing the above said facts, it can be concluded that Habit of precise thinking includes the five factors

1. Observing
2. Finding Patterns and Generalizing
3. Forming Conclusions based on Patterns
4. Assessing Conclusion based on observation
5. Thinking Critically

These basic processes allow making sense of the world, pulling together discrete bits of information into understandable and coherent patterns (Bruner, 1966; Carnine, 1990).

While evaluating the effectiveness of Advance Organizer Model in the teaching of Mathematics, all these factors were taken into account.