CHAPTER II
THEORETICAL OVERVIEW

A Model of Teaching is a description of a learning environment. The core of the teaching process is the arrangements of the environments within which the students can interact and study how to learn (Dewey, 1916). The descriptions have many uses, ranging from planning curriculum, courses, units and lessons to designing instructional materials-books and work-books, multimedia programmes and computer assisted learning programmes etc. Since the models provide learning tools to students, they are uniquely suited to the development of programmes for students whose learning histories are causes for concern.

Theories of learning and development have same implications in the classroom teaching. A teacher can act always upon these theories for teaching children in the classroom. But, these theories are sometimes inadequate for the development of a theory of teaching and maximizing learning on the part of pupils. It may be, further, mentioned that theories of learning and development are descriptive in nature. A theory of teaching on the other hand is prescriptive. It is prescriptive in the sense that it sets forth rules concerning the most effective ways of helping children to achieve knowledge, skills etc. A theory of teaching must attempt to set forth the best means of maximizing learning on the part of children. Theories of learning then describe the process of learning. A theory of teaching on the other hand sets forth the rules for improving students’ learning. The said description regarding need for a theory of teaching does not imply that theories of learning and development are irrelevant to a theory of teaching. Both of them are closely related. A theory of teaching cannot, however, be treated just as a mirror image of the theories of learning, but needs to be congruent with the theories of learning and development to which it subscribes. In fact, the most important long-term outcome of instruction may be the student’s increased capabilities to learn more easily and effectively in the future, both because of the knowledge and skill they have acquired and because they have mastered learning processes.
2.1 Emergence of Models of Teaching

A number of instructional strategies to realize different instructional goals have been developed by different researchers. The works done by Bruce Joyce and Marsha Weil (1980) is a monumental in this area. They have transformed existing knowledge in the learning and teaching process into ‘Models of Teaching’ which can be used by teachers in the Teaching Learning Process for realizing different instructional objectives. There is a need to incorporate a few ‘Models of Teaching’ in the curriculum of teacher education programme. Over the years a large number of learning theories have been developed by educationalists and psychologists. Such theories of learning alone do not suffice the purpose. Hence based on these theories, researchers have developed a number of teaching strategies to realize specific instructional goals. These teaching strategies show there is no single best way to teach something, but different strategies are required to utilize different instructional goals. These prescriptive teaching strategies which help to specialise specific strategies, which, in turn, help to specialise specific instructional goals, are known as ‘Models of Teaching’.

Bruce Joyce and Marsha Weil describe a Model of Teaching as a ‘plan or pattern that can be used to shape curricula, to design instructional materials and to guide instruction in the classroom and other settings’. Models of Teaching are really models of learning. As we help, students acquire information, ideas, skill, values, ways of thinking and mean of expressing themselves, we are also teaching them how to learn. In fact the important long-term outcome of instruction may be the student’s increased capabilities to learn more easily and effectively in the future, both because of knowledge and skills they have acquired and because they have mastered learning processes (Joyce and Weil, 1997:7).

Models of Teaching are designed for specific purpose, such as the teaching of information concepts, ways of thinking, the study of social values and so on by asking the students to engage in particular cognitive and social tasks. Some models centre on delivery by the instructions, while others develop on the learners response to tasks and the students are regarded as partners in the educational enterprise. However, all mature models emphasize how to help students learn to
construct knowledge learning how to learn including learning from the source that are often stereotyped as passive, such as learning from lecturers, films, reading assignments. ‘Quite a number of Models of Teaching’ are designed to increase students ability to process information more powerfully. These include methods for presenting information so that students can learn and retain it more effectively by operating on it conceptually, are also system that assist memorization and teach students to collect and organize information conceptually, and ones to teach students to use the methods of disciplines, to engage in casual reasoning and to master concepts (Joyce and Weil, 1997: 39).

Eggen, Kunchar and Harder (1979) have discussed six Information Processing Models. General Inductive Model, Concept Attainment Model, Taba Model, General Deductive Model, Ausubels Model and Suchman’s Enquiry Model. The most comprehensive review of teaching Models is that of Bruce Joyce and Marsha Weil (1980) who have identified models which are classified into four basic families based on the nature, distinctive characteristics and effects of models. These four families are:-

1. Information Processing Models
2. Personal Models
3. Social Interaction Models and
4. Behaviour Modification Models

With the families, there are specific models which are designed to serve particular purposes.

1. Information Processing Models

These models focus an intellectual capacity. They are concerned with ability of the learner to observe, organize data understand information, form concepts, employ verbal and non verbal symbols and solve problems. While research on how students learn to think is by no means a completed science, a variety of models can increase student’s ability to seek and master information, organize it, build and set hypothesis and apply what they are learning in their independent reading and writing and their exploration of themselves and the world
about them. Some of these models induce the students to collect information and build concepts. Others teach them to profit from direct instruction through readings, lectures and Instructional Systems.

The primary purposes of these information processing models are:-

1. The mastery of methods of enquiry
2. The mastery of academic concepts and facts
3. The development of general intellectual skills such as the ability to reason and think logically.

2. **Personal Models**

Models which belong to this family deal with the individual and the development of selfhood. The emphasis of these models is on the developing of an individual into an integrated, confident and competent personality. They attempt to help students to understand themselves and their goals, and to develop the means for educating themselves. Many of the personal models of teaching have been developed by counselors, therapists and other persons interested in stimulating individual’s creativity and self-expression.

**The Primary goals of these models are:-**

1. To increase students’ self-worth,
2. To help students to understand themselves more fully
3. To help students recognize their emotions and become more aware of the way emotions effect their aspects of their behaviour
4. To help them develop goals for learning
5. To help students develop plan for increasing their competence
6. To increase the student’s creativity and playfullness
7. To increase the student’s openness to new experience

3. **Social Interaction Models**

The models in this family emphasise the relationship of the individual to society or other persons. The core objective is to help students learns to work together, ie, identify and solve problems either academic or social in nature.
The Primary goals of these models are:- to help students work together to identify and solve problems to develop skills to human relations and to become aware of personal and social values.

4. **Behaviour Modification Models**

All the models in this family share a common theoretical base, a body of knowledge which referred to as behaviour theory. The common thrust of these models is to emphasis on changing the visible behaviour of the learner.

2.2 **Concept of Describing a Model**

The models developed by Bruce Joyce and Marsha Weil (1980) have a definitive structure. The four aspects of this common structure are:-


2.2.1 Syntax: (Phase or Steps) of the Model describes the model in action. It is the systematic sequence of the activities in the model. Each model has distinct flow of phases.

2.2.2 Social System: The social system describes the role and relationships between teachers and pupils. In some models the teacher has a dominant role to play. In some models the activity is centered around the pupils and in some other models the activity is equally distributed.

2.2.3 Principles of Reaction: Principles of Reaction tell the teacher how to regard the learner and to respond to what the learner does. They provide the teacher with rules of thumb by which to select suitable models, appropriate response to what the student does.

2.2.4 Support system: Support system describes the supporting condition required to implement the model. ‘Support’ refers to additional requirements beyond the usual human skills, capacities and technical facilities. This includes, books, films, laboratory kits, reference materials etc.
2.3 Effects of the Model

Each model results in two types of effects Instructional and Nurturant. Instructional effects are the direct effects of the model which results from the content and skills on which the activities are based.

Nurturant effects are which implicit in the learning environment. They are the indirect effect of the Model. The nurturant effect comes from experience, environments created by the model.

Every teacher faces a wide variety of problems in classrooms. An effective teacher can apply these models, resourcefully and creatively so as to solve the problems. The model of teaching gives ample opportunities to the teacher to adapt them to suit the classroom requirement. Only creative flexible and resourceful teachers will achieve the maximum benefits from the Models of Teaching.

Figure 2.1
Models of Teaching
2.4 The Information Processing Approach

Cognition is the act or process of knowing. There are three basic approaches to understanding cognition. One is the psychometric approach which measures quantitative changes in intelligence as people mature. The second approach is Piagetian approach, which emphasis the qualitative change in the way people think as they develop. The third approach is the information processing view which examines the progressive steps, actions and operation that take place when people receive, perceive, remember, and use information.

The steps in information processing are illustrated in the figure 2.2

![Figure 2.2](image.png)

**Figure 2.2.**
The steps in information processing

2.4.1 Steps in Information Processing

Information processing has often been compared to the action of a computer. Information is coded and fed into a computer in an organized way and then it is stored in the memory banks. When any of the information is required, the computer is asked to produce it. The machine searches for the relevant information and produces or prints out the items requested.

Information-processing by children is basically similar but far more sophisticated. The child receives information, organizes it, stores it, retrieves it, thinks about it and combines it to answer questions, solve problem and make decisions. The most elaborate computer used in creating artificial intelligence cannot match the capacity of human mind and nervous system in the input and output of information.

As each year passes, the child’s ability to process information increases, partially because of the continued development of the brain and the nervous system
Theoretical Overview

and partly because of the learning experiences and practice that improve mental abilities and strategies. The cognitive view of learning sees people as active processors of information. They initiate experiences that lead to learning, seek out information to solve problems and recognize what they already know to achieve new learning. Instead of being passively influenced by environmental events, people actively choose, practice, pay attention to ignore and make many other responses as they pursue goals.

2.5 Information Processing Models

Information processing models are teaching strategies based on information processing theories that are designed to help students to learn content at the same time as they practice thinking skills under the guidance and direction of an active teacher. In recent years considerable emphasis has been placed on the school’s role in the development of students’ thinking skills. (Costa, 1985). Educators have begun to recognize that this no longer sufficient to simply teach students what they should know, but in addition, they must be taught how to ‘know’. Information processing specifically provides one valuable framework for addressing the development of students’ thinking skills and abilities (Stenberg, 1985; 1986).

Optimal development of student’s intellectual abilities occurs in the classroom when learners are provided ongoing opportunities to practice these skills across diverse areas of curriculum.

Thinking skills have become an issue of major concern to educators in our country and around the world (Beyer, 1984; Costa, 1985). Perhaps in response to the long standing emphasis on basic skills the need for people to cope with the technological change, the increasing information orientation of our society and the world’s ever expanding body of knowledge.

Beyer (1984) describes thinking skills as existing in three major categories (1) the board skills such as problem solving (2) discrete and basic operation or process and (3) a combination of the two resulting in critical thinking.

Our snares are our first and most basic mechanism for gathering information. Items of information acquired in this way are called observation.
Conclusions formed on the basis of observation are called inferences, Generalizing inference can be defined as conclusions that summarise a series of observations to suggest a pattern on which explanations and predictions can be cleared.

Observing, explaining, predicting and generalizing are the foundation on which thinking is based. However there are important skills that derive from those fundamental ones.

They are ‘comparing’, which is the skill that ask the learners to identify similarities and differences in information, and ‘hypothesising’, which is an extension of the process of generalizing and allows learners to extend their thinking to another as yet unconsidered level. Critical thinking can be viewed as a derived skill that results from the ability to form valid generalizations, explanation, predictions, hypothesis and comparison or the ability to assess the validity of existing statements.

Reasoning can be described as proceeding in one of the two ways. We either summarise a series of observations to form a pattern, or we use pattern to explain or predict a particular event. The former is called inductive reasoning, which is the process involved in making generalizing inferences and the latter is deductive reasoning. Forming inferences and inductive and deductive reasoning are inextricably inter wined.

The product of thinking is called knowledge or content. Everything we teach in the school can be described in terms fundamental forms of knowledge. These forms are facts, concepts and generalization. Facts can be defined as the forms of content that are singular in occurrence which occur in the past or present and which have no predictive value. A concept is an abstracted motion that is based on a class of objects, events or ideas with common characteristics. Generalisation can be defined as relationships between two or more concept that usually can be described in cause affect terms, describe patterns and have explanatory and predictive value.

Information processing emphasises the process the individual uses to solve problems. Memory processes and problem solving have been the free uses of
information processing approach. Information processing models emphasise way of enhancing the human being’s innate derive to make sense of the world by acquiring and organizing data, sensing problems and generating solutions to them.

Some models provide the learner with information and concepts, some emphasises concept formation and hypothesise testing and still others generate creative thinking.

The major details regarding the information processing family are summarized through figure 2.3.

<table>
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<td>1. Advance organizer</td>
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<td>1. To develop: concept and conceptualization memory</td>
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<td>7. Synectics</td>
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**Figure 2.3**
The major details regarding the information processing family are summarized

Out of these various models which are included within the information processing family, the investigator selected certain members such as Advance Organiser Model, Inductive Thinking Model and Synectics Model for the study.
2.6 Advance Organiser Model

Family : Information Processing Model
Theorist : David P. Ausubel

David P. Ausubel is the theorist of this model. The Advance Organiser Model is designed to strengthen students’ cognitive structures – their knowledge of a particular subject at any given time and how well organized, clear and stable that knowledge is (Ausubel, 1963 P.27). Ausubel is also one of the few educational psychologists to address learning, teaching and curriculum simultaneously. His theory of meaningful verbal learning deals with three concerns (1) how knowledge (curriculum content) is organized (2) how the mind works to process new information (learning) and (3) how teachers can apply these ideas about curriculum and learning when they present new materials to students (Instruction).

2.6.1 Goals and assumptions

David P. Ausubel’s primary concern is to help teachers convey large amounts of information as meaningfully as possible. His theory is applicable to situations where teachers play the role of a lecturer. His purpose is to help students to acquire ideas and to internalise it them.

2.6.2 Characteristics of reception learning

Ausubel denies the criticism that has been brought against reception learning. It has been accused of learning to rote memorisation, fostering intellectual passivity rather than curiosity. Ausubel opines that meaningful verbal learning is not an easy task. Mere internalisation of the information is not its goal. Meaningful learning implies that what the learner has learned is intellectually linked and understood in the context of the previously learned. In this opinion, a meaningful learning set implies that the learner must be ready to comprehend and relate what is being presented, rather than to memorise its verbation. Since the learner has nothing to do with the present material in reception learning, it is assumed that reception learning is a passive one. But the learner has to be quite active in this type of learning. They must relate the new type of material to existing
knowledge judging which concept of proposition to catalogue the new knowledge under. Ausubel talks about learners’ struggling with the material, looking at it from different angles, reconciling it with similar or contradictory information and finally translating it into his own frame of reference. Ausubel assumes that for meaningful verbal learning to occur the learner has to play an active role. The teaching model for reception learning must be designed in such a way as to facilitate these type of active mental operation. An Advance Organiser Model is a deductive Information Processing Model. In this model an organising statement called Advance Organiser is presented at the beginning of the lesson.

Ausubel describes advance organisers as introductory material that is presented ahead of the learning task and at the higher level of abstraction and inclusiveness than the learning task itself. Its purpose is to explain, integrate and inter-relate the material in the learning task with previously learned material (Ausubel, 1963: 148).

Advance Organiser is a technique proposed by Ausubel for aiding learning and retrieval of information. This advance Organiser acts as a connection between the material to be learned and the learners cognitive structure. By cognitive structure, Ausubel means a person’s knowledge of a particular subject matter at any given time and how well organized, clear and stable it is (Ausubel, 1963: 27).

### 2.6.3 Overview of the Ausubel model

An advance Organiser can take any of the following forms namely,
1) a concept definition 2) an Analogy and 3) a generalisation After the presentation of the organiser, the content is developed. For this, the organiser is broken into subordinate concepts, or components and these are presented in a hierarchical form of structural outline. For developing the structural outline in a hierarchal form the technique of progressive differentiation is used, which is the process of breaking down broad ideas into narrow less inclusive ones. This process includes the consideration of similarities and differences between concepts or ideas. Through the process of integrative reconciliation the difference or inconsistencies in the material are solved. The desired outcome of the process of integrative
reconciliation is a unified body of knowledge in which relationships are noted and
differences or anomalies recognised.

According to Ausubel theory, meaningful verbal presentation help the
students in acquisition and retention of large bodies of subject matter and easy
learning.

2.6.4 Subsumption

‘For learning to be meaningful, the information should be frequently linked
or anchored to relevant aspects of an individual’s existing structure. This process
of linking information to pre-existing segments of cognitive structure is referred to

Subsumptive ideas process enough explanatory power to render otherwise
arbitrary factual details potentially meaningful. Another characteristic is that they
organize related new facts around a common theme, thereby integrating the
component elements of new knowledge both with each other and with existing
knowledge.

The characteristics of Advance Organiser Model may be listed as follows:
1) the statement of Advance Organiser 2) the formation of a structural hierarchy
and 3) the process of progressive reconciliation.

2.6.5 Planning for Ausubel Activity

Considering the above theoretical aspects, planning includes identifying the
goals, hierarchical structuring of content and formation of Advance Organiser.

‘The model can be used to teach both concepts and generalisation. It can be
used to long range planning as well as a teaching model to each content within a
lesson. The goals for an Ausubel lesson depend mainly upon background of the
learner. According to Ausubel (1961), whether a material is meaningfully depends
on the learner and the material, not the method of presentation.

Ausubel is of the view that each of the academic disciplines has a structure
concepts that are organized hierarchically. Several methods are used to form the
structure of content. They are: 1) Analysis of concepts into subordinate, co-
ordinate and super ordinate relationships. 2) Organising the content through the use of inter related generalisations. 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.

Formulation of the Advance Organiser in the final task is planning the model. The important functions of an Advance Organiser are: 1) It links the content of the lesson to the learners’ cognitive structure and 2) It helps to organize for the learner the material which is to be learned. The Advance Organiser acts as a subsumer. As explained in the overview of the Model, an Advance Organiser can take the forms namely, a concept definition, a generalisation and an analogy.

When the materials to be taught is new or unfamiliar to the students, definitions are valuable Organiser of the content. These definitions have to contain the concepts, super ordinate concept and characteristics of the concepts. If concepts are defined in terms of super ordinate concepts, the linking of new concept to concept which already exist in the learner’s cognitive structure becomes easy. Illustration of concrete experiences and review of previously learned material may serve as valuable reinforces. Generalisations are useful to summarize large amount of information. Hence they can be effectively used as Advance Organisers. But the concepts used in them must be familiar to students. Analogy is the most effective type of Advance Organiser. Analogies can be clearly designed and stated. Hence they are more appealing and motivating to students than definitions and generalizations.

2.6.6 Implementing activities

The implementing stage follows the planning stage. The model is expository because students are exposed to new knowledge through the actives of the model. The teacher acts as the primary source of information and learner receives this information. The teacher has to maintain an interactive environment in which students encouraged to participate and interact freely.

2.6.7 Syntax of the advance Organiser model of teaching

There are three phases of activity in the Advance Organiser Model.
Phase I: Presentation of Advance Organiser.

The Activities of this phase are:- Clarify the aims of lesson, present organiser and promote awareness of relevant knowledge and experience in learners background.

Phase II: Presentation of learning task or material

The Activities of this phase are:- Make logical order of learning material explicit to student, maintain attention and make organization explicit.

Phase III: Strengthening cognitive organization.

The Activities of this phase are:- Use principles of integrative reconciliation, promote active reception learning, elicit critical approach to subject matter and clarify.

2.6.8 Progressive differentiation

This is the process by which ideas are broken down or expanded. Based on the background of the students, the differentiation process can be operated. Interaction with the students is an essential fact. Progressive differentiation can be used to break a generalization down into less inclusive and more specific generalizations.

2.6.9 Integrative reconciliation

According to Joyce and Weil integrative reconciliation implies that ‘new ideas should be consciously reconciled with and integrated with previously learned content’ (Joyce and Weil 1972; 206-207). In this also the teacher-students integration through questioning and clarification is important. The exploration of similarities and differences in related ideas is an important tool for integrative reconciliation.

2.6.10 Components of Advance Organiser Model

The model consists of theory and practical training. To translate a theory into practical teaching form, a set of four concepts; syntax, principles of reaction, social system and support system are employed. Syntax describes the model as a
flow of actions. It is described in terms of sequences of events called phases. Principles of reaction guide the teacher’s response to the learner, they tell the teacher how to regard the learner and respond to what he or she does. Social system provides a description of students and teacher roles and relationships and the kinds of models that are encouraged. In the model selected for the study, the teacher acts as a reflector or a facilitator of group activity, a counselor of individuals and the source of input, the organizer of the situation.

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

Figure 2.4
Description of Ausubel Model
2.6.11 Instructional and Nurturant Effects

The important nurturant Effects are:-

(i) formation of conceptual structures

(ii) Meaningful assimilation of information and ideas.

The important Instructional Effects are:-

(i) stability to learn from reading, and other media used for presentation

(ii) interest in enquiry

(iii) habits of precise thinking

Instructional and nurturant effects of Advance Organiser model is given in figure 2.5.

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**Figure 2.5**

Instructional and Nurturant effects of Advance Organiser Model

2.7 Synectics Model

Family : Information Processing Model

Theorist : William Gordon
William Gordon and his associates (1961) have developed a procedure to help people break set and generate fresh solutions to problems, generate more lucid writing and speaking and coalesce groups around creative problem solving. Rather than conceiving of creativity as an isolating inward process, it is developed in groups and increases cohesion and empathy among group members. It can be agreed that the ability to go beyond the known and synthesize fresh ideas and solutions is the ultimate information processing skill.

2.7.1 Concept of Creative Thinking

People are of all ages are constantly confronted by problems and situations that require decisions and provide them opportunities to improve the human conditions and enable them to understand phenomena in their lives. Every day they must act or behave in new or different ways, because they are unable to solve the problems or resolve the situations using their current repertoire of knowledge and skills. Thus these problems and situations require creativity that is innovative or adaptive thinking and behavior.

Vernan (1989) suggests that there is a consensus that creativity means a person’s capacity to produce new or original ideas, insight restructuring, inventions or artistic objects which, are accepted by experts as being scientific aesthetic, social or technological value”.

According to one of the major leaders in creativity research and theory development, a product or response is creative if it is novel and appropriate solution to an open ended task”. A product or response is creative to the extent that appropriate observers independently agree it is creative.6

2.7.2 Some Thoughts on Creativity

An object that specifies creativity as its learning level requires students to think divergently to originate ideas, hypothesis or methods. Creativity is the development of new mental patterns. People tend to produce creative ideas in response to dissatisfaction with available methods, ideas, beliefs and principles for dealing with perplexing situations.
Contrary to the popular belief that aptitude for creative production is found only in rare exceptional individuals, virtually everyone possesses creative talents (Torrance, 1962). It is rare for talent to be recognized and rewarded. Historically society and its institutions have frowned on and generally discouraged creative thinking. Divergent reasoning threatens common beliefs and established truths. Irrational thoughts and emotionally controlled behavior are often associated with mental instability. However Gorden (1961) suggested that, irrational, emotionally charged thoughts tend to produce an environment more conducive to creative production than rational, controlled thoughts. Joyce and Weil (1984) stated, “non-rational interplay leaves room for open-ended thoughts that can lead to a mental state in which new ideas are possible. The basis for decisions, however is always rational; the irrational state is the best mental state for exploring and expanding ideas but it is not a decision making state”.

Gorden’s (1961) studies challenge typical views about creativity with four ideas.

1. Creativity is important in everyday circumstances; it should not only be associated with the development of great works
2. Creativity is utilized in all fields not just the arts
3. Creative thoughts can be generated by groups as well as solitary individuals via similar processes. This is contrary to the common view that creativity must be an intensely personal experience.
4. The creative process is not mysterious; it can be described and people taught to use it.

Gordon’s fourth point is critical to justifying the conclusion creativity level lessons in curricula. However, how to best teach for creativity is still not well understood. One difficulty is resolving the phenomenon that creative thoughts seem to rise unpredictably (Bourne, Dominowski, Loftus and Heavely, 1986).
2.7.2.1 Preserving Creativity

For teachers they can choose not to include creativity level objectives in their curricula. However, simply managing to preserve student’s and allowing it to grow requires some conscious effort on their part.

2.7.2.2 Fostering Creativity

A teacher may choose not only to preserve his students’ creativity, but also to conduct lesson that help them achieve creativity level objectives. Just as activities for affective objectives can be efficiently integrated into lessons for cognitive objectives, so too can activities fostering creativity be interwoven with those for other types of objectives (especially conceptualization).

The strategy is to conduct these other lessons so that students feel free to question, make mistakes and disagree with ideas, even teachers. Particularly important is for them to be positively reinforced (Cangelosi; 1988) for depending on themselves and on their own devices for decision making and problem solving.

One of the more systematic and researched methods for fostering creativity is referred to by its designer, William Gorden (1961) as synectics. (Joyce and Weil; 1984 pp. 159-183). Gordon grounds synectics in four ideas that challenge conventional views about creativity.

- First, creativity is important in every day activities
- Second, the creative process is not at all mysterious
- Third, creative invention is similar in all fields- the arts, the sciences, engineering’s and is characterized by the same underlying intellectual process.
- Forth assumptions is that individual and group invention (Creative thinking) are very similar.

Synectics is a means by which metaphors and analogies are used to lead students into an illogic state for situations where rational logic fails. The intent is
for students to free themselves to convergent thinking and to develop empathy with ideas that conflict with their own.

2.7.3 The Creative State and the Synectics Process

The specific process of synectics are developed from a set of assumption about the Psychology of creativity. First, by bringing the creative process to consciousness and by developing explicit aids to creativity. Second assumption is that the ‘emotional component is more important than the intellectual, the irrational more important than the rational (Gordon, 1961 p. 6).

The third assumption is that the ‘emotional, irrational elements must be understood in order to increase the probability of success in a problem solving situation’ (Gordon, 1961 a. p. 6). In other words, the analysis of certain irrational and emotional processes can help the individual and the group increase their creativity by using irrationality constructively. Aspects of rational can be understood and consciously controlled. Through the deliberate use of metaphor and analogy in the subject of synectic exercise students play with analogy unit they create and keep to enjoy making more and more metaphoric comparisons.

2.7.4 Metaphoric Activity

Through the metaphoric of the synectics model, creativity becomes a conscious process. Metaphors establish a relationship of likeness, the comparison of one object or idea with another objects or idea by using one in place of the other. Through these substitutions the creative process occurs, connecting the familiar with unfamiliar or creating a new idea from familiar idea. Metaphors introduce conceptual distance between the student and the object or subject matter and prompts original thoughts. Synectics strategies using metaphoric activity are designed, to provide a structure through which people can free themselves to develop imagination and insight into everyday activities.

2.7.5 Analogy

The term ‘analogy’ means a practical likeness or agreement. These are three types of analogies used in synectic process. They are:
2.7.5.1 Personal analogy

To make personal analogies, requires students to empathize with the ideas or objects to be compared. Students must feel they have become part of the physical elements of the problem. The identification may be with a person, plant, animal or non-living thing. Gordon (1961) identifies four levels of involvement in personal analogy.

1. First person description of facts: The person recites a list of well-known facts but presents no new way of viewing the object or animal and show no empathetic involvement.

2. First person identification with emotion Empathetic identification with a non living object. The person recites common emotions but does not present new insights.

3. Empathetic identification with a living thing the student identifies correctional and kinesthetically with the subject of the analogy.

4. Empathetic identification with a non living object. This level requires the greatest commitment. The person sees himself or herself as an inorganic object and tries to explore the problem from a sympathetic point of view.

An instructional implication of research on analogical reasoning is that students may need framing in how to use familiar systems to help them understand unfamiliar scientific systems.

2.7.5.2 Direct Analogy

Direct analogy is a simple comparison of two objects or concepts. The comparison does not have to be identical in all respects. Its function is simply to transpose the conditions of the real topic or problem situation to another situation in order to present a new view of an idea or problem. This involves identification with a person, plant, animal or nonliving thing.

2.7.5.3 Compressed Conflict

The third metaphoric from is compressed conflict. Generally a two- word description of an object in which the words seem to be opposites or to contradict
each other. Gordon’s examples are life saving destroyer and nourishing flame. He also suggests Pasteur’s expression, safe attack as compressed conflict.

2.7.6 Stretching Exercises: Using Metaphors

These three types of metaphors form the basis of the sequence of activities in this model of teaching. They can also be used separately with groups as a warm-up to the creative process, that is, to problem solving.

2.7.6.1 Thinking and Analogy

When confronted with a new problem, where does the idea for a new solution come from? According to analogical transfer theory, problem solver uses existing knowledge about previously solved problems (known as the “source domain” or “base domain”) for analogical transfer to occur, a source domain, abstract the relevant information from the target domain that correspondence to the source and map the solution procedure for the source to the target.

2.7.7 Components of Synectics Model

2.7.7.1 Syntax of Synectics Model

There are two strategies based on synectics procedures. One is designed to make the familiar strange (creating something new) to help students see old problems, ideas or products in a new more creative light. The other strategy is designed to make new unfamiliar ideas more meaningful. Although both strategies employ the three types of analogy their objectives, syntax and principle of creation are different.

2.7.7.1.1 Strategy I - Creating Something New

The first strategy (creating something new includes six phases)

1. In this phase the teacher and the students describe the situation or situations as they see it now.

2. The student will suggest a number of analogies and discuss them, finally they will choose one analogy to concentrate on.

3. Student will become the analogy which they choose in this former stage
4. Students discuss the descriptions and situations they have come up from phase two and three and suggest a number compressed conflicts and choose one.

5. Students generate and select another direct analogy based on the compressed conflict

6. Students and teacher discuss the final analogy and relate it to the original task or problem

Table 2.1 gives the Syntax for the first strategy – creating Something New.

Table 2.1
Syntax for synectics model strategy I

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase One</td>
<td>Description of present Condition</td>
</tr>
<tr>
<td>Phase Two</td>
<td>Direct Analogy</td>
</tr>
<tr>
<td>Phase Three</td>
<td>Personal Analogy</td>
</tr>
<tr>
<td>Phase Four</td>
<td>Compressed Conflict</td>
</tr>
<tr>
<td>Phase Five</td>
<td>Direct Analogy</td>
</tr>
<tr>
<td>Phase Six</td>
<td>Reexamination of the Original task.</td>
</tr>
</tbody>
</table>

2.7.7.1.2 Strategy two - Making the strange Familiar

In this strategy, metaphor is used for analyzing, not for creating conceptual distance as in strategy one., the teacher might present the concept of culture to his class. Using familiar analogies, the students begin to define the characteristics that are present and through that lacking in the concept. The strategy is both analytic and convergent, students constantly alternate between defining the characteristics of the more familiar subject and comparing these to the characteristics of the unfamiliar topic.
The second strategy includes seven phases

1. Explaining the new topic, students are provided with informative
2. In this phase, the teacher or students suggest a direct analogy and ask students to describe the analogy
3. Teacher and students become the direct analogy that choose in phase two
4. In this phase students identify and explain the point of similarity between the new material and the direct analogy
5. In the fifth phase students explain the differences, between the analogies. That is students explain where the analogy does not fit
6. Students re-explore the original topic on its own terms
7. In this last phase, students provide their own direct analogy and explore the similarities.

Table 2.2 gives the syntax for the second strategy – Making the Strange familiar.

Table 2.2

Syntax for synectics model strategy II

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase One</td>
<td>Substantive Input</td>
</tr>
<tr>
<td>Phase Two</td>
<td>Direct Analogy</td>
</tr>
<tr>
<td>Phase Three</td>
<td>Personal Analogy</td>
</tr>
<tr>
<td>Phase Four</td>
<td>Compressing Analogies</td>
</tr>
<tr>
<td>Phase Five</td>
<td>Explaining Differences</td>
</tr>
<tr>
<td>Phase Six</td>
<td>Exploration</td>
</tr>
<tr>
<td>Phase Seven</td>
<td>Generating Analogy</td>
</tr>
</tbody>
</table>

The major difference between the two, strategies lies in their use of analogy. In Strategy one, students move through a series of analogies without logical constraints; conceptual distance is increased, and imagination is free to
wander. In strategy two, students try to connect two ideas and to identify the connection as they move through the analogies.

2.7.7.2 Social System

The model is moderately structured, with the teacher initiating the sequence and guiding the use of the operational mechanisms. The teacher also helps students intellectualize their mental processes. Students however have freedom in their open-ended discussion as they engage in metaphoric problem solving. Norms of cooperation, “play of Fancy” and intellectual and to establishing the setting for creative problem solving emotional are essential.

2.7.7.3 Principles of Reaction

Instructors note the extent to which individuals seem to tied to regularized patterns of thinking, and they try to include psychological states likely to generate a creative response.

2.7.7.4 Support system

The group most of all needs facilitation by a leader competent in syntectics procedures. It also needs in the case of scientific problem a laboratory in which it can build models and other devices to make problems concrete and to permit practical invention to take place.

2.7.8 Using Synectics in the Curriculum

Synectics is designed to increase the creativity of both individuals and groups. Sharing the synectics experience can build a feeling of community among students.

Synectics procedures may be used with students in all areas of the curriculum, the science as well as the arts. Some possible uses of the creative process and accompanying emotional states are enumerated as follows :-

1. Creative writing
2. Exploring Social Problems
3. Problem solving
4. Creating a design or product

5. Broadening our perspective of concept.

Synectics combines easily with other models. Gordon, Pose and their associates have developed a wide assortment of materials for use in schools, especially in the language development areas (Gordon and Pose, 1976). The strategy is universally attractive and its fortunate combination of enhancing productive thinking and nurturing empathy and interpersonal closeness finds its many uses with all ages and most curriculum areas.

2.7.9 Instructional and Nurturant Effects

The synectics model contains strong elements of both instructional and nurturant values. Gordon clearly believes that the creative energy will enhance learning areas. To this end he emphasizes a social environment that encourages creativity and use group cohesion to generate energy that includes the participants to function interdependently in a metaphoric world.

![Diagram of Synectics Model](image)

**Figure 2.6**
Instructional and Nurturant Effects of Synectics Models
2.7.10 Goals and Assumptions

Gordon (1961) grounds synectics in four ideas that challenge conventional views about creativity. First, creativity as a part of our daily work and leisure lives. His model is designed to increase problem-solving capacity creative expression, empathy and insight into social relations. He also stresses that the meanings of ideas can be enhanced through creative activity by helping us see things more richly.

Second, the creative process is not at all mysterious. It can be described, and it is possible to train persons directly to increase their creativity. In contrast to the traditional method, Gordon 1961 believes that if individuals understand the basis of creative process, they can learn to use that understanding to increase the creativity with which they live and work, independently and as members of groups. Gorden’s view that creativity is enhanced through training procedures that can be applied in schools and other setting.

Third creative invention is similar in all fields- the arts, the sciences engineering and is characterized by the same underlying intellectual processes. This idea is contrary to common belief. Gorden maintains that the link between generative thinking is the arts and in the sciences is quite strong.

Gorden fourth assumption is that individual and group invention (creative thinking) are very similar. Individuals and group generate, ideas and products in much the same fashion. Again, this is very different from the stance that creativity is an intensely personal experience, not to be shared.

2.8 Inductive Thinking Model

Family : Information Processing Model
Theorist : Hilda Taba

Inductive Thinking Model is based on the theory of Hilda Taba who has developed a series of Teaching strategies designed to help and develop inductive mental processes especially the ability to categorise and to use categories.
2.8.1 Goals and Assumptions

Hilda Taba built her approach around these assumptions.

1) Thinking can be taught. By teaching she means helping students to develop inductive thinking ability.

2) Thinking is an active transaction between the individual and data. This means the students are presented with sets of data from a particular domain. They organize the data into conceptual systems, relating point in the data to each other, generalizing from, relationship they discover, making inferences to hypothesis predict and explain phenomenon.

3) Process of thought evolves by a sequence that is ‘lawful’ Taba postulates that, to master certain thinking skills, a person must first master certain earlier ones, and this sequence cannot be renewed. Therefore “This concept of lawful sequences requires teaching strategies that observe these sequences” (Taba, 1966, pp.34, 35).

2.8.2 Characteristics of Inductive Thinking Model

The Inductive Thinking Model is a straightforward and powerful strategy designed to develop the thinking skills of observation, comparing, finding patterns and generalizing while at the same time teaching specific or generalization. In addition, this model has the extrinsic advantage of promoting high level of interaction and increased student motivation. Its effectiveness depends on the teacher as an active leader as students process information.

These are two primary differences between teaching a concept and teaching a generalization. Examples are important while teaching a concept whereas generalizations are often taught without the use of non examples. These second difference exists in their application. We apply the concept by giving the pupils additional examples to analyse and then asking them to supply their own. On the other hand, students should apply a generalization by asking for additional examples or using it to explain an observation on set of observations.
2.8.3 Thinking Strategies

Taba identifies three inductive thinking skills and then describes three thinking strategies to develop them. The first one is the basic thinking strategy is concept formation, the second is interpretation of data, and the third is the application of principles.

2.8.3.1 Strategy 1: Concept Formation

This strategy involves:

1. Identifying and enumerating the data relevant to a topic or problem
2. Grouping these items into categories whose members have common attributes and
3. Developing labels for the categories. To engage students on each of these activities Taba invented teaching moves in the form of tasks given to the students

2.8.3.2 Strategy 2: Interpretation

Taba’s second teaching strategy is built around the mental operations; she refers to as interpreting, inferring and generalizing. Students build hypotheses about relationships inferring causation and explore these hypotheses to build generalization.

2.8.3.3 Strategy 3: Application of Principles

This strategy follows the first two: a unit of course would lead the students from concept formation activities to activities requiring interpretation of data and then to activities requiring application of principles. It is the task of predicting consequences from conditions that have been established, at each stage, students would be required to expand their capacities to handle information, first developing new concepts, then developing new ways of applying established principles in new situations.

The first phase of this strategy requires students to predict consequences, explain unfamiliar data or hypotheses. In the second phase students attempt to
explain or support the prediction or hypotheses. In the third phase students verify these predictions or identify conditions that would verify the predictions. Begin by leading the students through activities based on data sets presented to them and in later lessons teach them how to create and organize data set.

2.8.4 Application

Since each of Taba’s teaching strategy is built on a particular mental or cognitive task, the primary application of the model is to develop thinking capacity. The third strategy by asking students to go beyond the given data, is an elaborate attempt to increase productive or creative thinking. Inductive processes thus includes the creative processing of information, as well as convergent use of information to solve problems.

The model causes students to collect information and examine it closely to organize it into concepts and learn to manipulate three concepts used regularly. The strategy increases the students abilities to form concept efficiently and also the perspectives from which they can view information.

2.8.5 Components of Inductive Thinking Model Syntax

Strategy 1 Concept Formation

Phase I : Enumeration and Listing
Phase II : Grouping
Phase III : Labelling and Categorising

Strategy 2 Interpretation of Data

Phase IV : Identifying critical relationships
Phase V : Exploring relationships
Phase VI : Making inferences
Strategy 3 Application of Principles

Phase VII : Predicting Consequences, Explaining unfamiliar Phenomena

Phase VIII : Explaining or supporting the predictions

Phase IX : Verifying the prediction

2.8.5.1 Social system

In all the three strategies, the atmosphere of the classroom is cooperative with a good deal of pupil activity. Since the teacher is generally the initiator of phases and the sequences of the activities is determined in advance. He or she begins in a controlling, though co-operative, position. However, as students learn strategies, they assume greater control.

2.8.5.2 Principles of Reaction

Teacher matches tasks to students level of cognitive activity and determines students readiness.

2.8.5.3 Support System

Students need raw data to organize and analyse.

2.8.6 Instructional and Nurturant Effects

The Inductive Thinking Model is designed to instruct students in concept formation and simultaneously to teach concepts. It nurtures attention to logic, to language and the meaning of words and to the nature of knowledge. The instructional and nurturant effects of inductive thinking model are given in figure 2.6.
Figure 2.7
Instructional and Nurturant effects of Inductive Thinking Model