

## PAPER 5 : PEDAGOGY - 1 MATHEMATICS

1. Critically evaluate various approaches to mathematics curriculum construction

### APPROACHES TO CURRICULUM ORGANIZATION :

There are different approaches to organize the mathematics curriculum. The important among them are as follows

#### 1) TOPICAL APPROACH :

\* In topical approach a topic once presented should be completely exhausted in the same class.

\* This method demands that the entire topic, the portions easy as well as the difficult, should be covered in the same stage.

#### DISADVANTAGES :

→ This is not a psychological approach as the student are forced to learn many things for which they have no immediate need and relevance.



→ Some parts of the topic will be more complex and difficult for the learner to understand at the stage.

→ It does not take into account the mental development of the students.

→ It introduces a large amount of irrelevant matter, the use of which cannot be appreciated by the learner at the stage.

→ Topics once completed receive no attention at larger stages and there is every likelihood of them being forgotten.

## ii) SPIRAL APPROACH:

\* The Cambridge Report (1963) on Mathematics Curriculum emphasized the importance of interrelating and interweaving the different mathematical topics to be taken up throughout the school period and envisaged the progressive broadening and deepening the child's mathematical knowledge and insight by what is called the "Spiral Approach".



\* Therefore, contrary to topical approach, spiral approach demands the division of the topic into a number of smaller independent units to be dealt with in order of difficulty, suiting the mental capacities of children.

\* For example, 'Set Theory' can be split up into various subunits and arranged in the increasing order of difficulty.

#### ADVANTAGES OF SPIRAL APPROACH:

→ Subject matter is introduced in the increasing order of difficulty, in accordance with the needs and capacities of the students.

→ It satisfies the psychological needs of the students.

→ The students are able to appreciate the relevance and significance of what they learn.

→ It provides sufficient motivation



for the students to learn.

→ It provides opportunities to relate the topic with other topics, other branches and other subjects.

### iii) LOGICAL AND PSYCHOLOGICAL APPROACH:

\* The arrangement of subject matter based on the principles of psychology is known as psychological approach..

\* In other words, this approach is in tune with the principle of child-centeredness.

\* In the logical approach stress is given to the logical sequencing of the subject concerned.

\* Content of every subject have been developed in tune with such a logical sequence.

\* Logical approach demands maintaining the logical sequence while developing a curriculum.

\* At the same time, a good



curriculum, if carefully developed can maintain the psychological approach without sacrificing the logical sequence of the subject.

\* The only thing is that the logical continuity is taken care of at every stage of curriculum transaction done in tune with the psychological approach.

#### iv) UNITARY APPROACH :

\* The students learn mathematics with its different branches and topics in watertight compartments.

\* So, in the last few decades, the teachers in mathematics have searched for broad unifying principles which could be made the core of the mathematical course.

\* Such an organisation enables the pupils to see clearly the relationship between the various facts,



processes and principles taught in the course.

\* They know that each unit contributes to the course as a whole.

\* The question of time and size need not enter in the organization of a unit.

\* But for most high school pupils it may take more than a month to assimilate.

\* Experiences seem to show that a unit which can be studied in the four weeks is most suitable as to size.

\* When it is not possible to finish it within that time the teacher should find a way of simplifying the unit either by transferring some of the materials to other units or by dividing it into two smaller units.



## v) INTEGRATED APPROACH:

\* The main aim of education is acquisition of knowledge and the transfer of knowledge to study other subjects and to solve successfully the problems that arise in everyday life.

\* Each subject in the curriculum aims at realizing these aims through different means.

\* The study of every subject should highlight the unity of knowledge.

\* While teaching any subject, the teacher can cite instances and examples to show that knowledge is a single integrated whole and the knowledge that one gains through courses like mathematics, physical / biological sciences, social sciences, language, arts and other constitute a whole.



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\* Such an integrated approach helps the students to get a holistic view of the school programme and thereby the study of each subject becomes more meaningful and significant.

2. Describe the Gagne's eight types of learning and its educational implication.

### GAGNE'S EIGHT LEVEL OF LEARNING:

#### GAGNE:

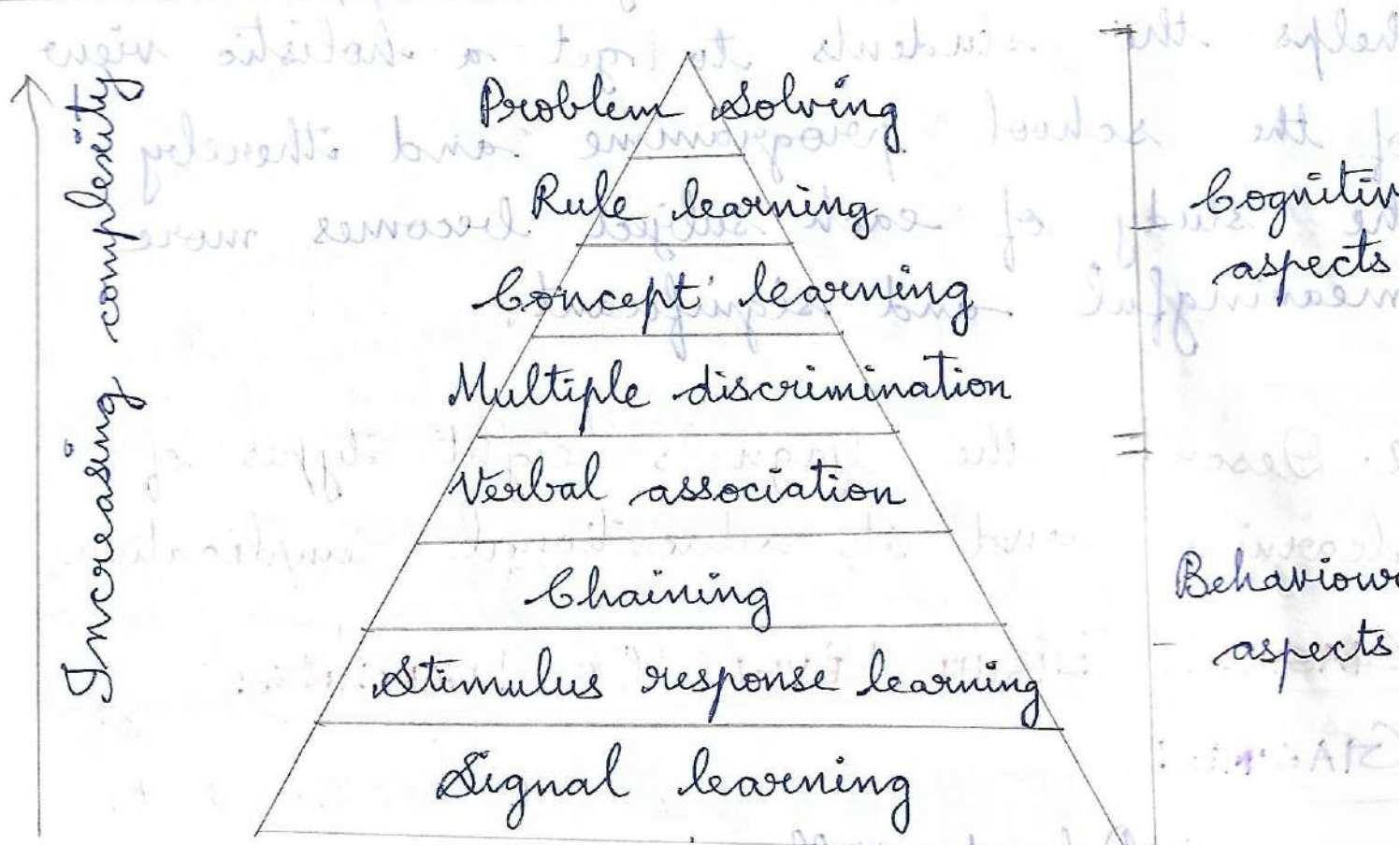
\* Robert Mills Gagne was an American Educational Psychologist best known for his conditions of learning.

\* Gagne's work is sometimes summarized as "the Gagne assumption".

\* Gagne's theory stipulates that there are several types and levels of learning, and each of these types and levels requires instruction that is tailored to meet the needs of the pupil.



# HIERARCHY OF LEARNING :



## 1. SIGNAL LEARNING:

\* This is the simplest form of learning, and consists essentially of the classical conditioning first described by the behavioral psychologist Pavlov.

\* In this type of learning the animal or individual acquires a conditioned response to a given signal.

Eg: \* When there is a Red signal in road, people stop their vehicles.



## 2. STIMULUS - RESPONSE LEARNING:

\* This is also known as operant conditioning, was originally developed by Skinner.

\* Stimulus - response learning is all about getting a response to a stimuli.

Eg: When a teacher instructs the students to raise their hands, the students immediately raise their hands.

## 3. CHAINING:

\* This type of learning is the ability to connect two or more previously - learned stimulus - response bonds into a linked sequence.

\* It is the process whereby most complex psycho motor skills (eg riding a bicycle) are learned.

\* In this type of learning the person links together previously learned Stimulus - Response.



Eg: Selecting an appropriate key from the bunch of keys.

#### 4. VERBAL ASSOCIATION:

\* This is a form of chaining in which the links between the items being connected are verbal in nature.

\* Verbal association is one of the key processes in the development of language skills.

\* This learning is a type of chaining, but the links are verbal units.

\* The simplest verbal association is the activity of naming an object, which involves a chain of two links.

Eg: When a child names an object "BALL", it also says "ROUND BALL", "BLACK AND WHITE BALL".



## 5. DISCRIMINATION LEARNING:

\* This involves developing the ability to make appropriate (different) responses to a series of similar stimuli that differ in a systematic way.

\* This involves the development of the ability to differentiate an OBJECT, by its colour, shape etc.

Eg: When seeing lots of cars in the road, differentiating the cars by its name.

## 6. CONCEPT LEARNING:

\* This involves developing the ability to make a consistent response to different stimuli that form a common class or category of some sort.

\* It forms the basis of the ability to generalize, classify etc.

Eg: While driving a bike, one must start with clutch, gear and then slowly release the clutch and raise the accelerator.



## 7. RULE LEARNING:

\* This is a very-high-level cognitive process that involves being able to learn relationships between concepts and apply these relationships in different situations, including situations not previously encountered.

Eg: When an air-filled Ball is kicked, it flies, rolls and revolves it is a common rule. In this rule concepts such as flying, rolling, revolving etc are learned.

## 8. PROBLEM SOLVING:

\* This is the highest level of cognitive process according to Gagne.

\* It involves developing the ability to invent a complex rule, algorithm or procedure for the purpose of solving one particular problem, and then using the method to solve other problems of a similar nature.



\* In the set of events called problem solving, individuals use rule to achieve some goal. When the goal is reached, however the student has learned something more and is then capable of new performances using his new knowledge.

### EDUCATIONAL IMPLICATIONS:

**GAIN ATTENTION:** The first event or step of instruction is to gain attention to get the reception of stimuli.

### INFORMING THE LEARNERS THE OBJECTIVE:

It is important to inform the learner of the purpose and expected outcome of the learning to provide the motivation to learners.

### STIMULATING RECALL OF PRIOR LEARNING:

The learners are asked to recall the existing relevant knowledge.

### PRESENTING THE STIMULUS:

Relevant stimulus to the subject



matter should be presented.

### PROVIDING LEARNING GUIDANCE:

It request instructor to make the stimulus as meaningful as possible.

### ELICITING PERFORMANCE:

The learners are asked to demonstrate the newly learnt behaviour

### PROVIDING FEEDBACK:

Giving informative feedback to learners performance is important.

### ASSESSING PERFORMANCE:

It consists of assessments to verify the learning has occurred.

### ENHANCING RETENTION AND TRANSFER:

It refers to retaining the land capability over a long period of time and transferring it to new situations outside the learning environment.