QCLP

Farook Training College Innovative Academia (FTCIA)

Online Collaborative Learning Project (OCLP)

Pre-Edited Version of Study Materials.

(Chance for minor errors)

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Unit 1

Pedagogic Analysis

MEANING

The word ‘Pedagogy’ comes from the Greek word “**paidagogos**” in which ‘**paida**’ means “child” and ‘**agog**’ means “lead” literally translated “ to lead the child”.

Pedagogy is the science and art of education specifically instructional theory. It is a master plan that includes a detailed analysis of what is to be done by a teacher.

By **pedagogic analysis** we mean a logical and systematic break up of the curriculum from the point of view of a pedagogue for the effective transaction of the subject matter, while making pedagogic analysis the teacher should consider the students too.

Objectives of pedagogic analysis...

- To analyse the curricular content into meaningful components that constitute the curriculum in it’s totality.
- To anticipate comprehensive instructional objectives appropriate to each component of the content and the development level of the learners.
- To identify the pre-requisites essentially needed for assimilating the curricular materials and experiences.

Objectives of pedagogic analysis

4. To enumerate comprehensively the inputs that might be required for effective curriculum transaction and to adopt strategies for pooling the inputs.
5. To design stage - appropriate, content - appropriate and objective-based learning experiences by which the inputs could be processed and objectives realised.
6. To anticipate probable difficulties and derive strategies for remediation and compensation wherever needed.

7. To anticipate strategies for continuous and comprehensive evaluation leading to mastery learning.

Scope of pedagogic analysis

- It forms an integral part of curriculum in all teacher education programmes.
- It helps the teacher to set educational goals in accordance with the needs and abilities of the learner as well as the characteristics of the content material.
- It provides teacher deeper insight into the curricular material and enables him to plan for realising maximum output.
- It helps the teacher in pooling the resources required for effective instruction.
- It would help the teacher anticipate difficulties and to be prepared for handling such situations.
- It enables the teacher to search for effective tools and techniques continuous evaluation and to use the results of this evaluation for monitoring the instructional process.

1. **Content analysis**

At first, the content should be analysed in order to find out the terms, facts, concepts, principles, generalisation, formulae, symbols, etc.

1. **Determination of objectives**

2. Major instructional objectives as well as specific objectives, to be realise must be decided in advance, while analysing the content, specific objectives vary from content to content.

3. **Listing the pre-requisites**

4. Pre-requisites needed for assimilating the new learning materials of the content or the unit should be comprehensively listed.

Steps in pedagogic analysis...

1. **Content analysis** : At first, the content should be analysed in order to find out the terms, facts, concepts, principles, generalisation, formulae, symbols, etc.

2. **Determination of objectives:** Major instructional objectives as well as specific objectives, to be realise must be decided in advance, while analysing the content, specific objectives vary from content to content.

3. **Listing the pre-requisites :** Pre-requisites needed for assimilating the new learning materials of the content or the unit should be comprehensively listed. Familiar facts and pre-concepts may be essentially required to assimilate and internalise a new broad concept. In this step we list all the pre-requisite needed for new learning

Steps in pedagogic analysis ...

4. Developing a pre-diagonostic test: In order to locate the gaps in the pre-requisites among the learner a pre-diagonostic test should be develop by the teacher as part of the pedagogical analysis.

5.Preparing the list of inputs: Here inputs means the instructional aids that can be used for effective instruction. There should have very wide range - sayfrom routine or innovative instructional aids to a visit to significant spots, business centres, etc.Any mediator, such as examples, anecdots, analogies, stories, etc. or any aid gathered from physical, natural and social environments should form part of the list.

Steps in pedagogic analysis...

6. Processing the input: The listed input should be processed for providing the content - appropriate, objective based, learner centred, environment based process oriented and comprehensive learning experiences.

7. **Suggestions for gathering immediate feedback and remediation:** Methods for collecting the feedback from the Students should also be decided in advance. This enables immediate knowledge of results, diagnosis, remediation and reinforcement. Techniques and strategies for continuous formative evaluation have to be decided upon for the purpose.

Steps in pedagogic analysis

- **Determination of assignments and activities:** Assignments and activities to be provided as part of the instruction should be decided in advance.
- **Determining the post diagnostic test :** A post diagnostic test should also be developed in advance. It can be in the form of detailed summative evaluation tool also.

Advantages of pedagogic analysis

The teacher can take steps to motivate students and develop interest among them.
The scientific analysis helps the teacher adopt learner centered instruction.
The content analysis which is a part of pedagogic analysis would make the instructional programme more systematic and content - appropriate.
Effective instructional aids and strategies will emerge as a result of pedagogic analysis.

Pedagogic Analysis would motivate and enable the teacher in implementing proper evaluation procedures.

2 Mark Questions & Answer key words

1. What is meant by pedagogic analysis?
2. What are the advantages of pedagogic analysis?

4 Mark Short Essays & Value Points

- Explain the steps in pedagogic analysis

10 Mark Essays & Value Points

1. Explain the scope and objectives of pedagogic analysis and explain the steps in pedagogic analysis.

Unit 2
Planning for Instruction

Why planning?

Planning is a must for successful execution of a task for project. It not only caters to the realisation of aim or purposes of doing that task, but also helps on proper utilisation of time, expenses and energy on the part of human being

Advantages of planning

- We can present the content in logical systematic way.
- We can identify the relevant and appropriate objectives to be realised
- We can save time, material and effort
- We can impart quality education
- We get opportunity to expert with our idea

Types of Planning

Depending upon the scope and aim, the module of planning will also vary.Major types of planning in instruction are as follows

1. Year planning
2. Unit planning
3. Lesson planning

1. Year Planning

- It is a plan prepared by the teacher in the beginning for a full academic year
- Here the teacher tries to take a complete view of what he has to do in the whole academic year
- It plans the curricular and co-curricular activities as per the curriculum for the entire academic year

Factors to be considered while preparing an year plan

- ★ Objectives of teaching learning to be realised
- ★ Nature and scope of the content
- ★ Types of learning experiences
- ★ Number of working days per term for the academic year
- ★ Number of units to be covered
- ★ Number of periods needed to cover each unit
- ★ Number of days allotted for project works, rec=vision test and examination.

- A unit is a large segment of subject matter having a common theme or idea.
- A unit can be split upto small subunits called topics and the topics are linked to one another by common ideas or principles.

  Eg:- circle - definition and elements, circumference and area of a circle, angle properties in a circle, tangent to a circle
- A unit plan may be considered as a suggested design for transacting the curriculum material involved in a ‘unit’, with predetermined objectives to be realised.

Steps in unit planning

1. Content analysis: After choosing the unit the teacher has to do a detailed analysis content of the unit to get an indepth knowledge of the terms, fact, concepts, principles, formulae, symbols, generalisations etc
2. Stating the general and specific objectives: The teacher should identify and state the general and specific objectives.
3. Planning the learning activities: In this step we select suitable learning experiences and teaching strategy that may lead to the realisation of the stated objectives.
4. Evaluation procedure: In this step we have to select appropriate evaluation tools and techniques to assess the content coverage, realisation of the objectives and the effectiveness of teaching strategy.

Advantages of unit planning

- It helps to plan a variety of learning experiences keeping in mind the individual differences, nature of the content and objectives to be achieved.
- It helps the teacher to present various principles and concepts in the unit in an orderly and systematic manner without losing continuity.
- Unit plan breaks up a lengthy unit into smaller subunits or topics. So that the pupil can easily grasp the content.
- It helps the teacher to plan definite outcomes of learning, so that they all clear not only to the teacher but also to the student

3.Lesson Planning

- A lesson may be defined as a compact portion of the curriculum to be transacted with in a short period of time

Definitions of lesson plan

- Lesson planning of a daily lesson related with a particular unit of a subject to be conveyed by the teacher in a specific school period for the realisation of source stipulated instructional objectives.
- It is a sort of theoretical chalking out of the details of the journey in which a teacher is going to perform practically in the classroom along with students

Advantages of planning a lesson

- It ensures definite aim for each day's work in terms of learning materials as well as learning objectives.
- It makes the work regular and systematic.
- It enhances self-confidence and self-reliance of the teacher.
- It ensures appropriate use of aids at the appropriate time.
- It prevents wastage of time, as every step has been planned with forethought
- It ensures proper assignment according to the mental level of students.
- It establishes proper connection between different lessons and thereby ensuring continuity

Comparison of lesson plan and unit plan

Lesson plan	Unit plan
1. A daily action	Extends over 8 to 12 periods depending on the subject matter
2. Content in logical, psychological order. Presented in the form of teaching points	Content grouped in terms of major & minor groups
3. Learning activities in detail	Evaluation activities just mentioned
4. Actual test items given	Evaluation tools and techniques just mentioned
5. Part of the whole	Made up of several lesson plans

Planning of lessons in constructivist format and behaviourist format

Behaviourist and constructivist lesson plan

- The behaviourist model refers to a way of teaching that focuses on how to impact a student's behaviour to meet a given objectives.
- The constructivist model refers to a way of teaching that relies on the students to construct their own meaning through the guidance of a teacher.

Format of behaviourist lesson plan

- Preliminary details
- Content analysis
- Previous knowledge
- Specific objectives
- Teaching aids
- Preparation
- Introduction
- Presentation
- Application
- Review
- Home assignment

Preliminary details.

- It is the first step of writing lesson plan
- Preliminary details including name of teacher, name of school, standard, subject, topic, date, time and strength.

Content analysis

- To analyse the actual content of the lesson.
- To determine the presence of terms, facts, concept, definition, process.

Previous knowledge

- Previous knowledge needed for assimilating the new learning material of the contents.
- Here we list all the previous knowledge needed for new learning.

Instructional objectives

- It is a statement that will describe what the learners will be able to do after completing the instructions.
- Instructional objectives are specific, measurable, short term, observable student behaviour.
- It is a focal point of lesson plan.

Teaching aids

- List the materials and resources that will be needed for the lesson to be successful.
- It may be models, figures, technology resources, etc.

Preparation

- The purpose of the lesson is the reason for teaching the lesson: to introduce, to give information, to demonstrate knowledge, to provide enrichment or a chance for creative application.

Introduction

- Motivating the students to learn by creating a puzzle or use an analogy to get them thinking alone the lines you want to go.
- Share the relevance of the lesson to students life.

Presentation

- The presentation phase is when the teacher introduces new information.
- Here teacher is dominant.

Application

- The teacher must evaluate the students to make sure that they are performing the new skill correctly and then provide activities that requires students to take what they have practiced in class and try to apply it correctly in real life situation.
- These real life situation may be in class, out of the class or both.

Review

- A review connect the current lesson with previous lesson by going over points that were taught or learned previously.
- It may be questions.

Home assignment

- Give students a chance to do something independently.
- This is a chance to do formative evaluation.

Format of constructivist lesson plan

- Preliminary details.
- Content analysis.
- Pre requisites
- Learning outcomes.
- Resources
- Product/values.
- Presentation.
- Follow up activity.

Preliminary details

- Preliminary details including name of teacher, name of school, standard, subject, unit, topic, date, time and strength.

Content analysis

- List the term, fact, concept, definition and process of the lesson.
- Analysis of actual content of the lesson

Pre requisites

- List all pre requisites needed for new learning.
- It is needed for assimilating the new learning material of the contents.

Learning outcomes

- It is a statement that provides a detailed description of what students will be able to do upon completing a lesson.

Resources

- List the materials and resources that will be needed for the lesson to be successful.
- List materials students will need also.

Product/values

- List the skills that students will be able to do after the lesson.

Presentation

- Visual aids, show a video, read, lead a discussion are the methods of presentation.
- The teacher guide presentation.
- Here students are dominant.

Follow up activity

- Give students a chance to do something independently.

Behaviourist format	Constructivist format
● In behaviourist format everything is virtually structured.	● In constructivist format everything is good structured.
● Learning is similar to a set time fame and an event occurs in a series of sequences.	● Learning is not set on specified time fame.
● The teacher role is one that is centered on structured experience.	● The teacher and the students are interact.
● Teacher is the leader and students are not active learner.	● Teacher is the leader and students are active participant.

Implications of Piaget,Bruner and Gagne in teaching mathematics.

Cognitive Development Theory: Jean Piaget

Jean Piaget (1896-1980) : History

• Born: August 9, 1896. Switzerland
• Died: September 16.1980 (Age 84)
Parents: Eldest son of Arthur Piaget and Rebecca Jackson.
• Education: Received Ph.D. from
University of Neuchatel in 1918.
Wife: Married to Valentine Chatenay in 1923
• Children: 3 children namely Jacqueline. Lucienne and Laurent whose intellectual development from infancy to language was studied by Piaget.

Introduction

Jean Piaget (1896-1980) was one of the 20th century's most influential researchers in the area of developmental psychology.

• He was originally trained in the areas of biology and philosophy and considered himself a "Genetic Epistemologist".

• Piaget wanted to know how children learned through their development in the study of knowledge.

He administered Binet's IQ test in Paris and observed that children's answers were qualitatively different.

• Piaget's theory is based on the idea that the developing child builds cognitive structures.
• He believes that the child's cognitive structure increases with the development.
• Piaget's Theory of infant development were based on his observations of his own three children.

What is Cognition?

The term cognition is derived from the latin word "cognoscere" which means "to know" or "to recognise" or "to conceptualise".

Cognition is "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.

What is Cognitive Development?

Cognitive Development is the emergence of the ability to think and understand.The acquisition of the ability to think, reason and problem solve.

Itis the process by which people's thinking changes across the life span.

Piaget studiedh Cognitive Development by observing children in particular, to examine how their thought processes changed with age. It the growing apprehension and adaptation to the physical and social environment.

According to Piaget, cognitive development takes place as a result of organization and re organization of schema

This process of organization and re organization of schema takes place through Adaptation

SCHEMA: Basic structural unit of one's cognitive structure OR Mental image formed from experiences
Strength of cognitive structure depends upon no. of schemas and varieties of schemas

ASSIMILATION: Process of incorporating unfamiliar schema (new information) into the existing cognitive structure with the help of familiar schema present in the existing cognitive structure

ACCOMODATION: Process of making changes or modification in one's existing cognitive structure or process of finding appropriate place for the new information in the existing cognitive structure

EQUILIBRIATION: Tendency to regain the state of equilibrium from the state of disequilibrium

OPERATION: Process of linking schemas to arrive at a solution for a problematic situation

REVERSIBILITY: Process of shuttling familiar schemas present in the existing cognitive structure and unfamiliar schema present in the problematic situation so as to arrive at solution for a problematic situation

Acc. to Piaget, cognitive development takes place as a result of interaction of the individual with his environment

Acc. to Piaget, cognitive development takes place through 4 stages:

SENSORI MOTOR STAGE(0-2):

A transitional stage for a person from a biological to a psychological being
Cognitive development takes place through sensory motor activities

- Pre-verbal
- Reflex actions
  In the first few weeks of life the baby's behaviour consists simply of reflex responses, such as sucking, stepping and grasping. Later the reflex disappears and the baby chooses what and when to grasp).

- Absence of object permanence (out of sight means out of existence)

(Object permanence: Understanding that object continues to exist even if they are hidden from the view)

Pre operational stage(2-7)

- Seantic function
- Egocentrism
- Decentering
- Animism
- Seriation
- Conservation

- Children have not yet mastered the ability to perform mental operations.

a. **Semantic function.** During this stage the child develops the ability to think using symbols and signs. Symbols represent something or someone else; for example, a doll may symbolize a baby, child or an adult.

b. **Egocentrism**. This stage is characterized by egocentrism. Children believe that their way of thinking is the only way to think.

c. **Decentering**. A pre-operational child has difficulty in seeing more than one dimension or aspects of situation. It is called decentering.

d. **Animism**. Children tend to refer to inanimate objects as if they have life-like qualities and are capable of actions.

e. **Seriation**. They lack the ability of classification or grouping objects into categories.

f. **Conservation**. It refers to the understanding that certain properties of an object remain the same despite a change in their appearance.

Concrete operational stage(7-11)

- De centration
- Ego centrism diminishes
- Reversibility of thought
- Classification and serialization
- Inductive-Deductive thinking

Formal operational stage(11 and beyond)

- Abstract thinking
- Logical thinking
- Critical thinking
- Problem solving
- Hypothetico-deductive reasoning

Educational Implications in mathematics learning:

- learning activities or experiences should be planned according to the developmental stage of the learner
- The teacher should pose before the child challenging problematic situation so that his intellectual equilibrium is not lost
- Teacher can guide the student in the process of linking the new experiences with familiar ones,but the main responsibility for constructing the knowledge and systematically developing the cognitive structure should rest with the learner

- The teacher must study the maturational levels of pupils
- Teacher must teach according to the maturational level of the pupil and see to that he is ready to gain the content of mathematics. Otherwise time slips by without the learner attaining as much as possible
- Hastening the readiness of a pupil for learning mathematics does not work. The maturational level will indicate what he can / cannot be taught
- The needs to be an adequate amount of concrete materials available for teaching since through the age of eleven ,the stage of concrete operations is still in the offering
- Securing attention for learning is salient since learners do not achieve unless they mentally operate upon the content being presented
- New learning should be connected to relevant previous knowledge

Cognitive development theory:J S Bruner

J.S Bruner was born in New York.

He was one of the key figures of cognitive revolution

He put forward his theory during the year 1966

His theory is not about the stages of intellectual development , rather about how children represent knowledge and understand the surroundings

Acc. To Bruner,

intellectual development evolved as a result of maturation, training and experiences

And through a series of sequential modes or representation…

Enactive mode

Iconic mode

Symbolic

● Learning Modes

- Enactive - Learn through movement or action ---> Play with a books
- Iconic - Learn through images or icons --> Look at the pictures
- Symbolic - Learn through absttract symbols ---> Read for research

Enactive

The first stage he termed "Enactive", when a person learns about the world through actions on physical objects and the outcomes of these actions.

Iconic

The second stage was called "Iconic" where learning can be obtained through using models and pictures.

Symbolic

• "Symbolic" in which the learner develops the capacity to think in abstract terms.

• Based on this three-stage notion, Bruner recommended using a combination of concrete, pictorial then symbolic activities will lead to more effective learning

: **Discovery learning teaching method**

Inquiry based process Focuses on learning through experience Inductive Reasoning - using specific examples to formulate a general principle.

Spiral construction of curriculum (revisits concepts) • Learner builds on past experience • Students interact with environment • Discovers facts and relationships on own • Students create own construct of knowledge through narrative

SPIRAL CURRICULUM

Also called recycling. Bruner believes that children learn when they are exposed to a subject many times in different ways. In this way, teachers move from basic concepts to more complex ones over time. This theory is the basis for the way most school curricula and text books are organized.

: Educational implications…

Teacher needs to have an excellent knowledge of the structure of knowledge since these key ideas become objectives for learner attainment

To achieve objectives on the pupils‘ part, the teacher needs to sequence learning opportunities so that individuals experience the enactive, the iconic, and the symbolic in that order.

Spiral curriculum

The teacher needs to become a quality asker of questions involving the ongoing mttathematics lesson so that pupils can truly learn in an inductive manner. Inductive teaching then assists pupils to achieve the structural ideas.

Inductive teaching in mathematics must be used together with the enactive, iconic, and symbolic materials of instruction

Concept attainment model(concept is a mental image of a set of objects or any phenomenon that could be classified into a ‘set’, all members of which obey a set of attributes..eg : triangle (3 sides , closed)

GAGNE’S HEIRARCHY OF LEARNING

Robert Mills Gagne

Born in Aug 21, 1916
Died in April 28, 2002
Born in in North Andover, Massachusetts
educational psychologist
best known for his "Conditions of Learning'
involved in applying instructional theory to the design of computer based learning.

In 1956, the American educational psychologist Robert M. Gagné proposed a system of classifying different types of learning in terms of the degree of complexity of the mental processes involved. He identified eight basic types, and arranged these in increasing order of hierarchy

According to Gagné, the higher orders of learning in this hierarchy build upon the lower levels, requiring progressively greater amounts of previous learning for their success. The lowest four orders tend to focus on the more behavioral aspects of learning, while the highest four focus on the more cognitive aspect.

Signal Learning

o This is the simplest form of learning, and consists essentially of the classical conditioning first described by the behavioural psychologist Pavlov. In this, the subject is 'conditioned' to emit a desired response as a result of a stimulus that would not normally produce that response. This is done by first exposing the subject to the chosen stimulus (known as the conditioned stimulus) along with another stimulus (known as the unconditioned stimulus) which produces the desired response naturally; after a certain number of repetitions of the double stimulus, it is found that the subject emits the desired response when exposed to the conditioned stimulus on its own. The applications of classical conditioning in facilitating human learning are, however, very limited.

Stimulus-response learning

o This somewhat more sophisticated form of learning, which is also known as operant conditioning, was originally developed by Skinner. It involves developing desired stimulus-response bonds in the subject through a carefully-planned reinforcement schedule based on the use of rewards' and 'punishments'. Operant conditioning differs from classical conditioning in that the reinforcing agent (the 'reward' or 'punishment') is presented after the response. It is this type of conditioning that forms the basis of programmed learning in all its various manifestations.

Chaining

This is a more advanced form of learning in which the subject develops the ability to connect two or more previously-learned stimulus-response bonds into a linked sequence. It is the process whereby most complex psychomotor skills (eg riding a bicycle or playing the piano) are learned.

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.

Discrimination learning

This involves developing the ability to make appropriate (different) responses to a series of similar stimuli that differ in a systematic way. The process is made more complex (and hence more difficult) by the phenomenon of interference, whereby one piece of learning inhibits another. Interference is thought to be one of the main causes of forgetting.

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.

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. It forms the basis of the learning of general rules, procedures, etc.

[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.

- **Educational Implications in mathematics learning**
- Need for mastery of pre-requisites to learn a particular item(If the prerequisites are not achieved one cannot master the expected knowledge or skill)
- The need for establishing linkages to help the learner to smoothly proceed from one stage to another
- The teacher needs to go back a step or level if a pupil does not understand what is to be done

2 Mark Questions & Answer key words

4 Mark Short Essays & Value Points

1. How a constructivist lesson plan differ from behaviourist lesson plan?

10 Mark Essays & Value Points

1.Expain the educational implications of piaget,Bruner and Gagne in mathematics learning.

Unit 3
Models of Teaching

GROUP MEMBERS

1) FATHIMA SITHARA.P
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MODELS OF TEACHING

Plan or pattern that can be used

- to shape curricula
- to design instructional materials
- to guide instruction in classroom or other instructional settings.

DEFINITIONS

- **JOYCE AND WEIL(**1972**:**3**):**Teaching model is a “pattern or plan” which can be used to shape a curriculum or course, to select instructional materials and to guide a teachers action.
- **JOYCE AND WEIL(**1978**:**2**):**A model of teaching consist of guidelines for designing educational activities and environments.It specifies ways of teaching and learning that are intended to achieve certain kinds of goals.

- **PAUL D. EGGEN, ET AL(**1979**:**12**):** Models are prescriptive teaching strategies designed to accomplish particular instructional goals.
- **JANGIRA AND OTHERS(**1983**:**10**):**A model of teaching is a set of interrelated components arranged in a sequence which provides guidelines to realize specific goal.It helps in designing instructional activities and environmental facilities.Carrying out of these activities and realization of the stipulated objectives.

CHARACTERISTICS

- Models of teaching are some sort of pattern or plans prepared in advance for the success of the teaching learning process.
- They differ from general teaching techniques and strategies in the sense that they are designed to meet specific objectives or goals.
- Provide specific guidelines or blue print in advance for the realization of the specific objectives by specifying the teaching activities and controlling the teaching learning environment.

- Help in creating a proper teaching-learning environment.
- Provide systematic procedure and organized efforts for the desirable modification of the behaviour of the learners.
- They first specify the teaching or learning outcomes in behavioural terms and then lay down a step by step procedure for the attainment of these outcomes.

- Help the teacher in the task in the same way as an engineer is helped in the construction of a building or bridge by an appropriate model or blueprint prepared in advance.
- Save the energy,time and efforts of the teacher and the learners besides providing economy to the best utilization of the other teaching learning resources.

FUNCTIONS

- It may help a teacher to develop his capacity to teach larger number of children and create conducive environment for their learning.
- It may help curriculum makers to plan learning centred curriculum which provides a variety of educational experiences to children.
- It may help to create more interesting and effective instructional materials and learning sources.

- It may stimulate the development of new and better forms and opportunities for education,that will replace the schools of today.
- It may help to formulate a comprehensive theory of teaching.
- It may help to make the class a “shared environment”.

FUNDAMENTAL ELEMENTS

- FOCUS
- SYNTAX
- SOCIAL SYSTEM
- PRINCIPLES OF REACTION
- SUPPORT SYSTEM
- INSTRUCTIONAL & NURTURANT EFFECTS

FOCUS

- Focus is the central aspects of a teaching model.
- Objectives of teaching and aspects of environment generally constitute the focus of the model.
- Every teaching model is based on one or the other objective as its focal point.
- It is the nucleus of a teaching model.
- Any teaching model is developed by keeping this focal point in mind. Every teaching model differs from another in terms of its objectives.

SYNTAX

- Syntax of the model describes the model in action.
- Syntax includes the sequences of steps involved in the organization of the complete programmed of teaching.
- Each model has a distinct flow of phases.
- Teaching activities and interactions between a pupil and the teacher are determined.
- The syntax of any teaching model means those points which produce activities focused on educational objectives at various phases.

SOCIAL SYSTEM

- This element is concerned with the activities of pupil and the teacher and their mutual relationships.
- Every teaching model has separate objectives and will have therefore separate social system.
- It is related with the interactive roles and relationship between the teacher and the student.
- In some models the teacher has a dominant role to play.
- In some the activity centered around the pupils.
- In some other models the activity is equally distributed.

PRINCIPLES OF REACTION

- Principles of Reaction tell the teacher how to regard the learner and to respond to what the learner does.
- This element is concerned with the way a teacher should regard and response to the activities of the students.
- These responses should be appropriate and selective.

SUPPORT SYSTEM

- Support system describes the supporting conditions required to implement the model.
- ‘support’ refers to additional requirements beyond the usual human skills, capacities and technical facilities.
- The support system relates to the additional requirements other than the usual human skills or capacities of the teacher and the facilities usually available in the ordinary classroom.
- Includes books,films, laboratory kits, reference materials etc.

INSTRUCTIONAL AND NURTURANT EFFECTS

- Instructional effects of a lesson - purposefully envisaged by the teacher.
- Nurturant effects refers to the indirect effects that might happen as a by-product.
- Some of these by-product may be desirable while others may be undesirable.

FAMILIES OF TEACHING MODELS

- Bruce R.Joyce has divided all the teaching models under the title “MODERN TEACHING MODELS” .
- They identified 23 models which are classified into four basic families based on,
    - The nature.
    - Distinctive characteristics.
    - Effects of the models

BASIC FAMILIES OF TEACHING MODELS

The four basic families of teaching models are,

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

1. INFORMATION PROCESSING FAMILY

- Concerned with intellectual development of the individual.
- Help to develop the method of processing information from the environment.
- Focus on intellectual capacity
- They are concerned with the ability of the learner to
    * Observe
    * Organize data
    * solve problems

* Understand information.
* Form concepts.
* Employ verbal and nonverbal symbols.

The primary purposes of this family are,

1) Mastering the methods of enquiry.
2) Developing the skill for processing information.
3) Fostering the ability to think logically.

THE MODELS WHICH BELONGS TO THIS FAMILY

1. The Concept Attainment Model - Jerome S.Bruner
2. Inquiry Training Model - J.Richard Suchman.
3. The Advance Organizer Model - David Ausubel
4. Mnemonics Model -Pressley,Lewin,Anderson
5. Cognitive Development Model - Jean piaget,Kohlberg,Siegal.
6. Inductive Thinking Model - Hilda Taba
7. Scientific Enquiry Model - Joseph schwab.
8. Synectics Model - Bill Gordon

2- PERSONAL FAMILY

- Assist the individual in the development of selfhood.
- Emphasis is on developing an individual in to an integrated, confident,and competent personality.
- They attempt to help students understand themselves and their goals,and to develop the means for educating themselves.
- Developed by counsellors,therapists and other persons interested in stimulating individual’s creativity and self expression.

Primary goals of this family are,

1. To increase the student's self worth.
2. To help the students to understand themselves.
3. To help the students recognize their emotions and become more aware of the way emotions affect other aspects of their behaviour.
4. To help them develop goals for learning.
5. To foster students' creativity.
6. To increase students' openness to new experience.
7. To help students to develop plans for increasing their competence.

THE MODELS WHICH BELONGS TO THIS FAMILY

1. Nondirective Teaching Model - Carl Rogers.
2. Enhancing self-esteem model - Abraham Maslow.
3. Awareness Training Model - William Schutz and George Brown.
4. Classroom Meeting Model - William Glasser.
5. Conceptual System Model

3. SOCIAL FAMILY

- Emphasize the relationship of the individual to the society or other persons.
- Core objective is to help students learn to work together to identify and solve problems, either academic or social in nature.

The primary goals of this family are,

1) To help students work together to identify and solve problems.
2) To develop skills for maintaining human relations.
3) To inculcate personal and social values.

THE MODELS BELONGS TO THIS FAMILY

1. Group Investigation Model - John Dewey, Herbert Thelen.
2. Role Playing Model - Fannie and George Shaftel.
3. Jurisprudential Inquiry Model - Donald Oliver, James P. Shaver.
4. Laboratory Training Model - National Training Laboratory.
5. Social Simulation Model - Cybernetics Psychologists.
6. Social Inquiry model - Thelen, Oliver, Shaver.

4. BEHAVIOURAL SYSTEMS FAMILY

- Share a common theoretical base, a body of knowledge which referred to as *behaviour theory.*
- Emphasis on changing the visible behaviour of the learner.

Specific goals of this family are,

1. To develop the competency to adopt behaviour styles appropriate to the given situation.
2. To learn strategies for self control through operant method.

continu…

3. To master techniques for stress reduction.
4. To foster leadership qualities

THE MODELS BELONGS TO THIS FAMILY

1. Mastery Learning Model - Benjamin S. Bloom
2. Contingency Management model - B.F. Skinner
3. Social Learning Model - Albert Bandura
4. Simulation Model - Carl Smith, Mary Smith
5. Direct Instruction Model - Tom Good & others

CONCEPT ATTAINMENT MODEL

I.THEORETICAL BACKGROUND

- This model has been developed, based upon the studies made by **Jerome S. Bruner** and his associates **Jacqueline Goodnow** and **George Austin.**
- This model has been developed, mainly to explain the nature of concepts and the strategies of concept formation.
- This model helps students to understand and learn concepts by identifying attributes or key features through a process of analysis,comparison and contrasting of examples.

Concept Attainment and Concept Formation

- **Concept Attainment** and **Concept Formation** are two strategies used for categorizing.
- In a **Concept Attainment**, the teacher gives the students examples of objects/ actions/ processes already classified the way she/he wants them to classify them.
- In **Concept Formation**, the teacher gives the students a lot of objects/ actions/ processes, and the students choose how to classify them.

Concepts

- Concepts are the ideas of abstractions that are formed as a result of categorizing data from a number of observations.
- Concepts are the fundamental building blocks of thoughts and beliefs.
- According to Bruner, a concept includes five **elements**. They are:
  1. **Name**
  2. **Examples**(positive & negative)
  3. **Attributes**(essential & non essential)
  4. **Attribute values**
  5. **Rule**

- **Name** is the word that describes a concept for communication.
  Eg:- Triangles, Prime numbers, Quadrilaterals, Trapezium, etc.
- **Examples** are instances (or items) that could be observed and studied during the process of categorisation. These may include items that are positive examples that obey all the essential cues used for categorisation leading to the concept as well as negative examples that do not satisfy all the cues of a positive examples.
  Eg:- For the concept of ‘Parallelogram’, various geometrical shapes such as triangle, ordinary quadrilaterals, trapezium etc may be presented as negative examples and geometrical shape of parallelogram may be presented as positive examples.

- **Attributes** are features or characteristics on the basis of which a number of items could be categorised into a particular group or class that represents the concept. There are essential and non essential attributes.
  Eg:- For the concept of ‘Parallelogram’, ‘four-sidedness’, ‘closedness’, and ‘parallelism of opposite sides’ are essential attributes, while specific size of the sides, angles,etc are non essential.
- **Attribute value** is the value range of each attribute.
  Eg:- For the attribute ‘acute angle’, attribute value is between 0 and 90. For the attribute ‘ the largest angle of a right triangle’, attribute value is 90.
- **Rule** is the definition formed to describe a concept on the basis of the essential attributes.
  Eg:- The concept ‘Triangle’ is defined as a three-sided closed figure.

A Test of Concept Attainment

An individual may be said to have attained a concept if he possesses:

1. Ability to **categorise** examples and non-examples.(as Yes or No)
2. Ability to **describe** the examples in terms of essential attributes and justify the categorisation.
3. Ability to precisely define the concepts in terms of the essential attributes.
4. Ability to **generate** one's own examples and justify.

Strategies for Concept Attainment

Bruner speaks of four strategies for internalising concepts. They are:

1. Simultaneous scanning
2. Successive scanning
3. Conservative focussing
4. Focus gambling

The main differences are noticed in terms of

- ➔ Use of attributes or hypotheses as the basis of searching, and
- ➔ Difference in the number of hypotheses used at a time.

In **scanning**, concept hypotheses are used - either many at a time or one at a time. In **focussing**, individual attributes are used - either many at a time or one at a time. The focussing strategies are holistic in nature whereas scanning strategies are partist in nature.

II. DESCRIPTION OF THE MODEL

1. **Focus**

   In practice, the model works as an inductive model designed to teach concept through the use of example.

2. **Syntax**

- ❏ Phase 1: Presentation of data and identification of concept.
- ❏ Phase 2: Testing the attainment of concept.
- ❏ Phase 3: Analysis of the thinking strategies.

Phase 1: Presentation of data and identification of concept

- ➔ Teacher presents labelled (as Yes or No) examples.
- ➔ Students compare attributes in positive and negative examples.
- ➔ Students generate and test hypotheses.
- ➔ Students state a definition according to the essential attributes.

Phase 2: Testing the attainment of concept

- ➔ Students identify additional unlabelled examples as Yes or No.
- ➔ Teacher confirms hypothesis, gives the name and helps arrive at the restatement of the definition.
- ➔ Students generate more examples.

Phase 3: Analysis of the thinking strategies

- ➔ Students describe thoughts.
- ➔ Students discuss role of hypotheses and attributes.
- ➔ Students discuss type and number of hypotheses.
- ➔ Students recollect how they attain the concept.

3. Social System

- ➔ Teacher prepares in advance a list of positive & negative examples and labels them and sequence them. At this stage the teacher controls actions and so the social system is **highly structured**.
- ➔ In the subsequent phases student interaction is encouraged. Thus the social system becomes **moderately structured** and also **low structured**. Even then the teacher intervenes if necessary. Thus the nature of the structure goes on changing.
- ➔ The three major functions of the teacher are to **record**, **prompt** and **present** additional data.

4. Principles of Reaction

- ➔ Teacher acts as a **guide**, **motivator**, **facilitator** etc.
- ➔ Teacher supports the student's hypotheses and creates an atmosphere of meaningful dialogue.
- ➔ Teacher become **supportive** at the final phase and encourages different strategies.

5. Support System

- ➔ Success of lesson depends upon the presentation of **appropriate examples and non examples**.
- ➔ A **free atmosphere** that promotes active participation.

6. Instructional & Nurturant Effects

Instructional Effects:

- ➔ Getting clear notions about nature of concepts.
- ➔ Developing skills in using appropriate concept-building strategy.
- ➔ Attaining the specific concepts.
- ➔ Developing skills in inductive reasoning.

Nurturant Effects:

- ➔ Sensitivity to logical reasoning.
- ➔ Tolerance of ambiguity and initial errors.
- ➔ A sense of using alternative perspectives.

INQUIRY TRAINING MODEL

I.THEORETICAL BACKGROUND

- The Inquiry training model was developed by **Richard Suchman** to teach the students the art of independent inquiry in a disciplined way.
- It is designed to bring students directly into the scientific process through exercises that compress the scientific process into small periods of time.
- Training has resulted in an increased understanding of science, creative thinking, skills for obtaining and analysing information.
- The students are active learners involved in exploration, questioning, problem solving, inductive reasoning, invention, labeling and discovery.

ASSUMPTIONS

- All knowledge is tentative.
- There cannot be one answer to particular cause and effect question.
- People inquiry naturally when they are puzzled.
- The process of inquiry can be taught to students.
- Students can be conscious of and learn to analyse their thinking strategies.
- Team approach is better than individual approach to find solutions to a problem.

DESCRIPTION OF THE MODEL

Syntax

- Phase 1 : Confrontation with the Problem.
- Phase 2 : Data Gathering - Verification.
- Phase 3 : Data Gathering - Experimentation.
- Phase 4 : Organizing, Formulating an Explanation.
- Phase 5 : Analysis of the Inquiry Process.

Phase 1 : Confrontation with the Problem

➔ Teacher presents the problem situation.

➔ Teacher explains the Inquiry Procedures to the students.

Phase 2 : Data Gathering - Verification

➔ Learners gather information about the event / problem to verify the nature of the objects and conditions.

➔ Learners verify the occurrence of the problem situation.

Phase 3 : Data Gathering - Experimentation

- ➔ Learners with the help of the teacher search for the related data and isolate relevant ones with a view to find out relations.
- ➔ Learners hypothesize a solution to the problem.
- ➔ Hypothesis are confirmed or revised.

Phase 4 : Organizing, Formulating an Explanation

- ➔ Learners explain the hypothesis that has been accepted as tentative solution to the problem.
- ➔ Students state their explanation so that the range of the possibilities are noted.

Phase 5 : Analysis of the Inquiry Process

- ➔ Ask the learners to review the process they have just used to arrive at acceptance of the hypothesis (their pattern of inquiry).
- ➔ Discuss ways in which they could have improved their inquiry.

Rules for creating the Climate for Inquiry

1. The questions should be phrased in such a way that they can be answered by ‘YES’ or ‘NO’.
2. Once called upon a student may ask as many questions as he wishes before stopping his inquiry.
3. The teacher does not answer YES or NO to the statement of theories.
4. Any student can test any theory at any time.
5. Any time the students feel the need to confer with one another, they should be free to hold a conference.
6. Inquirers should be able to work with experimental kits, or resource book at any time.

Social System

- ➔ The social system is cooperative.
- ➔ Although the teacher plays a dominant role in presenting the puzzling situation, in the inquiry session teachers and students participate as equals.
- ➔ As the students learn the principles of inquiry, the teacher guides them to use the resource material and perform experiments and conduct discussion with other students.
- ➔ The tasks of the teacher includes act as a referee in the inquiry, respond to the students inquiry, probes with necessary information, helps students to arrive at explanations etc.

Principle of Reaction

The task of the teacher can be summed up as below:

- ➔ Ensure that the phrasing of questions is done correctly.
- ➔ Ask students to rephrase invalid or vague questions.
- ➔ Point out unvalidated statements.
- ➔ Use the language of the inquiry process.
- ➔ Neither approve nor reject student theories; leave this to other students.
- ➔ Ask students to make clear statements of theories and provide support to their generalisation.
- ➔ Encourage interaction among students.

Support System

- ➔ A set of discrepant events.
- ➔ Technical understanding of the intellectual process and strategies of inquiry.
- ➔ Teacher may require resource material related to the problem.

Instructional and Nurturant Effects

Instructional Effects :

- ➔ Scientific process skills
- ➔ Strategies for creative inquiry

Nurturant Effects :

- ➔ Spirit of creativity
- ➔ Autonomy in learning
- ➔ Tolerance of ambiguity
- ➔ Tentative nature of knowledge

The skills needed for training Inquiry

The success of this model depends on the mastery of the following skills by the teacher.

- Designing and presenting the discrepant event.
- Guiding pupils to account for the discrepancy.
- Explaining the rules of the inquiry process.
- Guiding and handling verification questions (to be answered as ‘YES’ or ‘NO’).
- Guiding and handling experimentation questions.

- Guiding interaction among students.
- Guiding theory building.
- Guiding the review of the steps of the inquiry process.
- Guiding the analysis of the thinking process.

INDUCTIVE THINKING MODEL

I.THEORETICAL BACKGROUND

- Inductive thinking model is designed to train learners in mental processes by which we interact with data or bodies of information, interpret these and arrive at generalisation.
- This model is based on the work of **Hilda Taba** who developed a series of teaching strategies designed to help students in organising information and exploring the relationship among sets of data.

ASSUMPTIONS

This model rests up on the basic assumption that skill of thinking can be taught in sequential manner. Hilda Taba built this approach around three assumptions.

- Thinking can be taught .
- Thinking is an active interaction between the individual and the data.
- Process of thought evolves by a sequence that is lawful.

II. DESCRIPTION OF THE MODEL

1. Syntax

- ❑ Phase 1 : Data categorisation (Concept formation)
- ❑ Phase 2 : Interpretation of Data
- ❑ Phase 3 : Application of Generalisations

Phase 1 : Data categorisation (Concept formation)

- ➔ Listing sufficiently large number of appropriate items.
- ➔ Learners group them on the basis of similarities.
- ➔ Labelling that group.

Phase 2 : Interpretation of Data

- ➔ Comparing (Identify critical relationships)
- ➔ Explaining (Exploring relationships)
- ➔ Generalising (Making inferences)

Phase 3 : Application of Generalisations

- ➔ Predicting :- Learners are asked to apply their generalisations in unfamiliar situations .Students are to form predictive inference on the data to which they were exposed in earlier phases.
- ➔ Supporting the prediction :- Teacher support the learners by asking questions like : “ What would happen if….? “ and “ Why do you think so ? “

➔ Verifying the prediction :- Verifying the prediction using logical reasoning so as to determine the conditions under which such generalisations is true.

2. Social System

➔ Environment of the classroom is very cooperative.

➔ Teacher is the initiator and the director of the activities.

➔ Teacher prepares all activities in sequence hand.

➔ As the students learn the strategies , they assume greater control.

3. Principles of Reaction

- ➔ To provide clear guidance for activities of reacting and responding within each phase.
- ➔ To make the cognitive task at the optimum level.
- ➔ To complete the enumeration and listing activities beforehand.
- ➔ To monitor the students to handle information properly.
- ➔ To construct suitable elicting questions.
- ➔ To make the students ready for new experience and cognitive activities.

3. Support System

- ➔ The data could either be presented by showing some charts or other audio-visual aids or activities like field trips.
- ➔ The students can be asked to go for data collection.

III. INSTRUCTIONAL AND NURTURANT EFFECTS

1. Instructional effects :

i. Concept formation process

ii. Specific Concepts

2. Nurturant effects :

i. Attention to logic

ii. Sensitivity to language

iii. Awareness of the nature of knowledge

2 Mark Questions & Answer key words

1. What is an attribute of a concept? Give an example.
2. Explain the elements of a concept.
3. Write any two models from Information Processing Family.
4. What do you mean by “models of teaching”.
5. Define “models of teaching”.

4 Mark Short Essays & Value Points

1. What is a concept? What are the elements of a concept?
2. Briefly explain Concept Attainment Model. List out the phases of CAM model.
3. Describe the syntax of Inquiry Training Model.

10 Mark Essays & Value Points

1. Prepare a lesson plan using Inductive Thinking Model by choosing a suitable topic from Std. VIII Mathematics textbook?
2. Prepare a lesson plan using Inquiry Training Model by choosing a suitable topic from std IX Mathematics textbook.

Unit 4
Resources in Mathematics Education

Group Members

1.Linsha VV
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MANJU K

TEXT BOOKS

- Textbooks are standardized collection of the subject matter that has been prescribed for a particular stage.
- It is the most using teaching aid and reference book for the mathematics teacher
- It is prepared to suit the age level of the learner
- It give emphasis on correlate the theoretical knowledge with the practical aspect of life.
- Subject matter presented in it is well planned way to facilitate learning of new ideas in an effective manner.

It give direction to the classwork and helps in evaluating pupil progress.
Teacher’s oral presentation of textbooks is widely used teaching instrument
A good textbook probably is the cheapest and reliable source of information.
The content organized in it is systematic and specific manner.
“ The textbooks are means to an end and not an end by itself ”

NEED AND IMPORTANCE

1. FOR THE TEACHERS

❖ *For comprehending the subject matter prescribed by the curriculum*.

- ➢ A textbook suggest the scope of subject matter expected by the syllabus
- ➢ It provides number of illustration and questions for exercise that could help the learner, master the subject matter.
- ➢ It helps the teacher not to waste time on irrelevant details

- *As a reference material*
  - It acts as most reliable source of information
  - Written by experienced teacher
  - References are quoted about original source of information
- *For assigning drill work and homework*
  - Mathematics is a subject that essentially requires practice.
  - It provide homework and drillwork to the students in tune with pattern suggested by the textbook
- *For planned and systematic teaching*
  - It helps teacher to teach in an organized and systematic way which makes the teaching learning effective.
- *For guidance*
  - It provides some important guidelines to the teachers about the presentation of a topic in the class.

- *For evaluation*
  - Textbooks help in the selection and construction of various types of problems for a test.

2. FOR THE STUDENTS

- Helpful for self study
  - A student can learn a topic in advance with the help of textbook
  - Textbooks are also quite useful to those students who remain absent from the class due to any reason.
- *Helpful in understanding the concepts*
  - Sometimes students are unable to understand the concepts and certain complex ideas exposed by the teacher in the class. Textbook help the student to understand such subject matter by reading it again and again.

- *Helpful to use as per requirements and desire of the pupil*
  - Textbook contains some solved problems which are helpful to students in solving other similar problems.
- *Helpful for gifted childrens*
  - The needy learner can learn topic in advance with the help of textbook
- *Helpful for mentally retarded and backward childrens*
  - It is useful for those children who cannot progress with other students in the class
  - They can learn and proceed according to their capacity

TEACHER'S HANDBOOK

- It is the excellent reference material for effective mathematics teaching.
- In kerala, it is prepared by SCERT along with textbooks.
- It helps teachers to monitor the programme.
- It contains list of teaching aids, summaries of what is learnt, well organized exercise , etc….
- A bibliography of relevant books and journals should be included.
- It promote self expression,supplemented by assignment of various types.

IMPORTANCE

1. It equips the teacher with sufficient theoretical knowledge and practical suggestions of what is to be taught.
2. It provides stable learning experiences for different instructional situations.
3. It helps teachers to adopt appropriate methods and approaches of learning.
4. It helps teachers prepares various instructional materials.
5. It helps the teachers evaluate learning outcomes using relevant and standard tools of evaluation.

WORKBOOK

- ★ A workbook is a modification of the textbook and it is slowly gaining prominence in mathematics classroom
- ★ A good workbook suggests appropriate activities exercises in addition to what the textbook does.
- ★ It saves time for the students as they need not recopy the problems and exercises from the textbook.
- ★ It is supplementary teaching device.
- ★ It provides opportunities for pupils to develop computation and problem solving skills.
- ★ It helps slow learners to learn at their own pace.
- ★ If the exercises are well graded it can satisfy requirements raised by individual differences.

ADVANTAGES

- ❏ Workbook supplements classroom learning
- ❏ It promotes self learning and self assessment.
- ❏ It provides for working out different types of assignments.
- ❏ It gives practice of classroom learning and their by reinforces learning
- ❏ It promote mathematisation.

REFERENCE MATERIALS

- These are effective aids of learning.
- It supplements classroom instruction
- It promote pupils self study habits and spirit of self effort
- It helps pupil to work out assignments.
- It stimulate scientific thinking and inculcate the elements of scientific attitudes.
- The teacher should bear in mind that the reference materials are comprehensible and readily available for the pupils.
- Reference materials are books, journals, magazines and e-materials.

LINSHA VV

TEACHING AID

Teaching aids are the tools that use in the classroom. A teaching aid is tool used by teachers to help learner improve reading and other skills,illustrate or reinforce a skill,fact,an idea and relieve anxiety,fears or boredoms

Need of teaching aids

- Teaching aid are important because they create a visual and interactive experience for the students
- Teaching aids assist students in learning these aids consist of video,audio and hands on tools to help involve the students and enhance the learning experience
- Teaching aids are an integral component in any classroom.

- The tools are designed to involve the students, promote interaction and promote faster learning and better comprehension
- Teaching aids can be as basic as a blackboard.Audio amd visual equipments are commonly used as tools for learning with a very effective output
- Students tend to get more involved when learning if teaching aids are implemented into the curriculum

Importance of teaching aids

- Motivation
- Clarification
- Discouragement of cramming
- Increase the vocabulary
- Classroom live and active
- Direct experience

Audio Visual Aids

Definition

- According to Burton, AV aids are those sensory objects or images which initiates or stimulates and reinforce learning
- According to Good's dictionary of education AV are anything by means of which learning procesa may be encouraged or carried our through the sense of hearing and sense of sight

Need and importance of audio visual aids

Audio visual aids assist a teacher in providing suitable learning experience to learners,in the form of audio and or visual perceptions that would help them acquire new information more effectively.Such experiences would help to make impressions meaningdul and lomg lasting and to develop skills.Learning can be made easier and effective if verbal exposition is supplemented by the use of audio-visual aids.

Audio-visual aids:

1. Help to learn more amd remember for long
2. Give reality and vividness to learning situations
3. Provide intrinsic motivation for learning
4. Give clarity to learning and reduce verbalism
5. Make the abstract concrete
6. Provide variety in methods of teaching and learning
7. Make learning interesting,meaningful and permanent
8. Develop deeper understanding of abstract maths concepts
9. Arouse curiosity and stimulate self activities

Classification of AV aids

AV are classified into

1.Projected aids 2.Non projected aids

Projected aids:

Projected aids are defined as in which still pictures are enlarged and display on screen.

Examples,

Film strips:-A film strips is one of the projective audio visual that a fixed sequence related still on roll of 35mm film

Over Head Project:-Machine design to project an image,text,and drawing onto small screen or white board

Opaque Projector:-A device which displays opaque materials by shining a bright lamp onto objects.

Non Projected aids :

Non projected aids are those aids which are used without any projection.It can be translate abstract ideas into more realistic format it can be easy to use because it does not require any equipments.

Following are non projected aids,

Audio aids	Graphic aids	Display board	Activity aids
Radio Television Recording	Charts Cartoon Diagram Flash cards Graphs Maps Photographs Posters Models Pictures	Blackboard Flannel board Magneticboard Peg board	Demonstration Experiment Field trips

Advantages of AV aids	Disadvantages of AV aids
● It makes learning and teaching effective ● It can be used for drill and revision ● It capture attention ● Highlights main points of messages clearly	● Time consuming ● Encourage passive learning ● It costly and so all can not afford it ● Being prepared to new technologies requires additional effort of the part of teacher and students

Improvised Aids

Improvised aids are those which are available at cheap price or low cost and developed by locally available resources and expedite the process of learning in the class room.These are sometimes developed by un-useful materials and help teachers in making teaching interesting concrete.Once the teacher is able to arouse deep interest in doing so,the result would be that they would repeat these experiments in their homes to evolve even homemade aids for the teaching mathematics.

Improvisation is to be developed as a habit, by linking with everyday dealings in life.Gradually mathematics teaching can be made meaningful by the use of audio-visual aids improvised by children themselves under the valuable guidance of the teachers concerned.The expected limitations of the teaching aid can be due to their size,colour,cost,etc.To remove these limitations and in order to make them more useful for students in a given situations the teacher can construct this himself,keeping in view all the requirements. These should help the students to learn the material in an easier way.

Importance of improvised aids

- Improvised teaching aids are used at nursery,primary, middle,secondary schools
- It is use for supplimentary and illustrative education in the science as well as in humanities.
- It is most suitable for subjects like science, geography,mathematics,crafts and arts
- It privides the joy of creation among children and gives them a sense of satisfaction
- It is a right direction towards inculcation of creative mathematical thinking

- Engaging in improvisation leads to the development of the dignity of labour among youngster
- It is the best way of spending ‘leisure with pleasure’by children
- Improvisation certainly leads to the saving money
- Students learn basuc skills in maths when they are engaged in improvisation of audio-visual aids fir their subject.
- It satisfies 3Hs-head,hand snd heart-of the learner,which is an important aim of mathematics education

- Improvisation if done continuously,promotes self confidence and generation of new ideas among students
- Interesting improvisation work helps students to remember their lesson more vividly than the ones verbally exposed in the normal mathematics classroom

MRUDULA

MATHEMATICS LAB

Importance

- It helps in making clear and understanding abstract concept.
- It saves teacher’s time by cutting short certain lengthy explanation.
- It enables the students to apply mathematical facts and principle in a actual life.
- It is a multisensory approach to learning.

- Habits of critical thinking and logical reasoning can be developed.
- Interest in learning mathematics can be developed.
- Scientific attitude can be developed among the students.
- Learners can be enabled to construct mathematical knowledge on their own.

Organization

- The mathematics lab is a place where anybody can experiment and explore patterns and ideas.
- It is a place where one can fund a collection of games, puzzles,

and other teaching and learning material.

- The activities create interest among students OR in anybody who want to explore and test some of their ideas, beliefs, about mathematics.
- The activities in the maths lab should be appealing to a wide range of people,of different ages and varying mathematical proficiency.
- The mathematics lab activities listed here have been done with students and teachers of different grade levels.
- The maths lab provides and opportunity for the students to

discover mathematics through doing.

Equipments

Mathematics laboratory serves not only as a laboratory but also as mathematics room and mathematics museum. Keeping in view the various purpose,it should have the following equipments.

1.**concrete materials**

It should be provided with concrete materials connected with simple arithematical topics such as a beads, sticks,pebbles,seeds,

ball frames,number cards, balances, coins, weights, measuring tapes, didactic apparatus which is used in Montessori method, scissors, pins, cardboard, chart paper, graphs, etc... .

It may also be provided with the following materials
A number kit: It consists of a set of wooden blocks of different colours,labeling the digits from one to ten Each block has the numeral and word representing the numeral.
*Place value pockets:*Is a box having three or four portions labeled as units,tens,hundreds,thousands,etc…..

Fractional parts:Is a series that is divided into halves, thirds, fourths, fifths, etc… .

Charts:Charts showing certain geometrical figures.

2.pictures and photographs

The pictures and photographs of various mathematicians and their contribution.

3.Models

- Various mathematical models such as those of triangles,squares,solids etc…

- Various models illustrating mathematical proofs or principles or statements

4.Backboard and Geometrical instruments

- The size of blackboard provided in the mathematics room should be larger than ordinary size.
- Provision for coloured chalks should be made in the laboratory.
- A set of geometrical instruments like protractors, compass,etc….be kept in laboratory.
- Stencils for drawing geometrical figures

5.Bulletin Boards or Display Boards

6.Equipments and Materials Concerning Other Subjects

- Equipments illustrating application of mathematics such as barometer, hydrometer, pendulum,

7.Proportional Dividers, slide Rules,Calculating Machines

8.Projective aids

Devices such as magic lantern, epidiascope etc... .

9.Surveying instruments

- *Angle mirror:*Used for laying out right angles in the field.

- *Plane table and Alidates:*Used for elementary mapping and sureying.
- *Hypsometer and clinometers:*Used for measuring angles of elevation and depression.
- *Level:*Used or finding difference in elevation
- *Transit:*An angle measurer and leveling instruments

10.Collection

Mathematical data from different sources such as data on graphs,budgets etc.. In the form of cutting,pictures,charts,etc..from various magazines, newspapers, books etc…

MATHEMATICS LIBRARY

Role

- It facilitate timely use of the book and inculcate reference skill.
- It promotes efficiency in the organization of library service.
- It develops the healthy hobby of reading during leisure time.
- Habit of self study and self education can be developed.
- It helps to supplement the knowledge learnt in the classroom.
- Students can improve their general knowledge by reading general books, magazines... … …..

Organization

- In mathematics library,there should br a good collection of useful books in mathematics
- It should be attractive and should provide an atmosphere conducive for reading
- It should be decorated with charts, pictures,posters……..which tells about the great mathematicians and their contributions.
- The seating arrangement must be comfortable for the student.

Effective functioning

- A mathematical library provides extra information necessary for mathematics.
- A mathematics library helps in drill and practice.
- It provides opportunities for filling up the gaps and removing the doubts
- it provides adequate materials and information necessary for completing the assignment and homework.
- It provides facilities for the gifted students to satisfy their curiosity and thirst for knowledge.

2 Mark Questions & Answer key words

1. What are the advantages of reference books in mathematics?(2017)
2. Write the importance of reference book in the teaching of mathematics? (2016)

4 Mark Short Essays & Value Points

1. What are the characteristics of a good textbooks in mathematics? (2016,2017)

Unit 5
Assessment for Mathematics Learning

Group members

1.Najiya CK
2.Nusra E
3.Varsha K

Najiya ck

CCE- Continuous and Comprehensive Evaluation - in Mathematics learning

- A system of school-based evaluation of students that covers all features of students' development.
- CCE provides accommodation for individual differences.
- It helps to develop all aspects of the child's growth to his optimum potential

CONTINUES

Regular and continuous activities conducted throughout the year to achieve all round development.

COMPREHENSIVE

Mental, emotional and physical aspects of the student's progress, i.e. all round development of the student.

EVALUATION

Variety of tools and techniques are used to assess and evaluate student's progress.

Objectives

- To help develop cognitive, psychomotor and affective skills.
- To make the process of teaching and learning a learner-centered activity.
- To make the assessment process an essential part of the teaching-learning process.
- To help the children to realize their potentials and capacities.
- To eliminate emphasis on memorisation.
- To help the teachers modify their teaching strategies.
- To motivate both teachers and children to improve the teaching-learning process.
- To emphasis the development of non-scholastic areas.

Characteristics

- A school-based evaluation consisting both scholastic and co-scholastic aspects.
- Broad based and covers all the aspects of learner's growth and development.
- Involves the process of assessing continuously and comprehensively through a variety of tools and techniques.
- The scholastic component of CCE conceptualizes evaluation of all academic subjects as spread over the entire span of the learning period (Term).
- It also includes physical education in its scope of assessment.
- Co-scholastic evaluation is the assessment of many informal and formal developmental areas such as life skills, attitude and values, wellness, service activities and work education.

Cont….

- CCE is carried out through Formative Assessment (FA) and Summative Assessment (SA).
- FA is criterion based, diagnostic and remedial.
- It offers feedback to the teacher and learner.
- SA involves regular and norm based assessment of all academic subjects at the end of a term.

Limitations

- The CCE may work only when there is happy and healthy teacher-taught relationship.
- It is not possible for a teacher to do CCE without thorough knowledge about his/her students and their background.
- Favouritism, blases, prejudices of teacher can be make the CCE subjective rather than objective.
- CCE will be difficult in a crowded classroom.
- It is time consuming.
- The grading system is its biggest disadvantage because student scoring 90 and 99 marks are both kept in graded A+.

Cont…

- Each and every activity is mentioned constantly.
- The act of copying and bribery is increasing in this field.

Advantages

- ★ Encourages the learning of students by including new teaching techniques and methods.
- ★ Explore the learning needs as well as potential of the students.
- ★ Encourages students to participate in extra-curricular activities instead of focusing largely on academics.
- ★ CCE fosters individual abilities of each child.
- ★ It develops the habit of library consultation.
- ★ Encourages additional life skills and thinking abilities.
- ★ It helps to remove the weakness in teaching-learning process.
- ★ It helps to develop confidence in the child.

Cont…

- ★ It develops the habit of self study as well as regular study.
- ★ It motivates both the teachers and students to improve their participation in instructional process.
- ★ It helps to develop the habit of advanced preparation of the lesson or topic.
- ★ Seminars, group discussions, tutorials etc lead to meaningful interaction between the teacher and pupil and also among students.
- ★ It provides periodical feedback to the child and teacher alike.

Nusra E

FORMAL AND INFORMAL TOOLS/TECHNIQUES FOR EVALUATING MATHEMATICS LEARNING

Formal and Informal

- Assessment can be either formal or informal.
- Formal assessment usually implies a written document, such as a test, quiz, or paper.
- A formal assessment is given a numerical score or grade based on student performance
- Whereas an informal assessment does not contribute to a student’s final grade
- An informal assessment usually occurs in a more casual manner.

FORMAL

- It is systematic , pre-planned data-based tests that measure what and how well the students have learned.
- It determines the students' proficiency or mastery of the content.

FORMAL ASSESSMENT STRATEGIES

- Achievement test
- Diagnostic test
- Observation
- Rating scale
- Check list

Achievement test

- Achievement test means one’s learning attainments , accomplishment,proficiencies etc.
- Achievement tests constitute an important tool of evaluation.
- It measures a pupil’s achievement and progression in a specific subject or topic over a set period of time.
- It necessary for the teacher to know how far the pupils have attained in a particular subject area.

DEFINITIONS

- According to Denis Baron and Harold W.Bernard," the concept of achievement involves the interaction of three factors namely, aptitude for learning, readiness for learning and opportunity for learning".
- According to Downie, "Any test that measures the attainments or accomplishments of an individual after a period of training or learning is called an achievement test".

Functions of achievement test

- Provide basis of promotion to the next grade.
- Help in finding out at the beginning of the year where each student stands in the various academic areas.
- Help in determining the relative position of a student in a particular subject or area of learning.
- Help the teacher to see for himself how effectively he is doing, what is getting across to pupils and what is not.
- Provide the teacher evidence relating to the realisation of the objectives, effectiveness of the learning experiences provide and mode of instruction employed.
- Help the teacher in identifying pupils' difficulties and arranging for remedial measures.

Types of achievement tests

Achievement tests used in schools are of two types:

- ★ Teacher made achievement tests.
- ★ Standardised achievement tests.

Types of teacher made achievement tests

1. Oral tests
2. Written or paper and pencil tests

Written tests can be classified as :

I. Long answer or Essay type.
II. Short answer type.
III. Objective type.

TEACHER MADE ACHIEVEMENT TESTS

- ❏ Teacher made test is one of the most valuable instrument in the hands of the teacher to solve his purpose.
- ❏ These tests are normally prepared and administered for testing class room achievement of students.

Oral tests

- Posing questions to students in spoken form.
- It used extensively in the lower classes as well as in the high school.
- Most mathematical teachers make use of oral tests to develop the mental skills necessary for increasing speed and accuracy and habit formation.

Standardised tests

- A standardised test is a test that is administered and scored in a consistent or “standard” manner.
- Any test in which the same test is given in the same manner to all test takers, and graded in the same manner for every one, is a standardised test.

Diagnostic tests

- Diagnostic assessment is a form of pre-assessment that allows a teacher to determine students' individual strength, weaknesses, knowledge and skills prior to instruction.
- It is primarily used to diagnose student difficulties.
- It helps to guide lesson and curriculum planning.

Informal strategies for evaluation

- Spontaneous forms of assessment that can easily be incorporated in the day-to-day classroom activities..
- Measure the students' performance and progress.
- Help the teacher to determine whether students learn the content taught in the class.
- So that the teaching learning process can be made accordingly.
- Useful for diagnosing student specific problem areas and adapting appropriate intervention strategies at an early stage itself.

Major informal techniques and tools

1. Application cards
2. Exit cards
3. Graphic organiser
4. Guided reciprocal peer questining

Application cards

- Used for knowing how far the students can transfer their learning to other situation.
- Students are asked to write at least one situation in which the learnt principle or procedure can be applied.

Setting up application cards

- ➔ Choose a big idea, topic, or principle that has broad real-world application for your students.
- ➔ Decide how many different applications you want students to brainstorm in order to allot the correct amount of time for this activity.
- ➔ Provide students with note cards ahead of time, or ask them to use their own paper for this C.A.T.

Exit cards

- Written student responses to questions posed by the teacher after a class or end of a day.
- These answers will help the teacher to know the student understanding of the concept.

Graphic organisers

- Graphic organisers are visual representations of the ideas attained by the learner.
- Concept maps, mind maps, etc are found to be effective tool for evaluating student understanding at the same time they work as effective learning tools.
- Graphic organisers are some of the most effective visual learning strategies for students and are applied across the curriculum to enhance learningand understanding of subject matter content.

Guided reciprocal peer questioning

- Students develop questions on what they have learnt and ask each other.
- So that they will understand what they know and do not know.
- It provides students with higher order open-ended questions to generate a focused discussion in a small group setting.
- The questions are generic prompts students use to generate specific content-based questions.

Varsha K

Construction of achievement test

Any test designed to assess the achievement in any subject with regards to a set of predetermined objectives is called an achievement test. The major steps involved in the construction of an achievement test are :

- Planning of the test
- Preparation of design
- Preparation of blue print
- Writing of the items
- Editing of the question paper
- Scoring key and making scheme
- Question wise analysis

Planning of the test

First of the standard, subject and content to be tested should be decided . A thorough content analysis is needed for preparation of the design of the test .

Preparation of design

The design of an achievement test specifice the weightages to ,

- Iinstructional objectives
- Units and sub units of the course content
- Form of questions
- Level of difficulty
- whether there is any options in the question paper is also mentioned in the design .

Preparation of Blue print

Blue print is a three dimensional chart with instructional objectives in one dimension, content in the second dimension and the form of question in the third. The test constructor has to decide up on the specific nature of the question paper . At this stage decision is to be taken on how many questions of each form should be selected from the first content , from the second content and so on for each instructional objectives . That is the paper setter decides how the questions are to be distributed over different objectives and content areas so as to satisfy the weightages decided in the design . A blue print makes a test construction systematic , ensures content validity of the test , relates objectives to content, gives a clear picture of the test , and the scope of the test is clearly indicated in the blue print.

Writing of the items

The next step is writing appropriate, quality items as specified in the blue print . Any one block can be taken first, it may be content box resulting in a pool of questions meetings the requirements specified in the blue print. After writing the items they are to be reviewed . This can be done by seeking the help of experts in the field. A careful evaluation of each question based on the form of question , wording of the statement etc will ensure the quality of the test.

Editing of the question paper

The questions should be arranged so that all items of the same type are grouped together and according to the difficulty . The question paper should contains clear and concise directions regarding the purpose of the test , time allowed to complete the test ,how to record the answer, marks allotted for each question etc.

Scoring key and marking scheme

Scoring key is prepared for scaring the objective type questions. It Consist of two columns with Question number in One column and the expected answer in the second column. In marking scheme , possible response to the items in the test are structured. The various value points for response are graded and the marks allotted to each value point is indicated. It helps to prevent inconsistency in judgement . It ensures objectivity in judgement.

Question wise analysis

The last step in the construction of an achievement test is quetion wise analysis.where each questions on various parameters stated in the blueprint is analysed to ensure that there is no inbalance in the question paper from that planned. It helps to ensure the qualities of an achievement test like objective basedness, comprehensiveness, reliability and validity.

Constructing a diagnostic test

A diagnostic test should be built around common student errors rather than attempting to sample broadly the learning outcomes. The teacher has to arrange the component abilities hierarchically and construct a subset for each of the component abilities for assessing the learning difficulties. For each component abilities a large number of items have to be framed. The items on each component ability constitute a subset. The greater the number of items included in a subset, the more reliably will be the diagnosis. According to Mehrens and Lehmann, developmentbof good diagnostic test is predicted upon two major assumptions :

1. Ability to analyse skills of knowledge into component subskilled and
2. ability to develop test items that will validly measure these sub skills.

Construction of the Diagnostic test encompasses five stages (Rajeswari,2004)

(i) Planning
(ii) Writing items
(iii) Assembling the test
(iv) Providing Directions and Preparing the scoring key and marking scheme.
(v) Reviewing the test

The details of the five stages of constructing a diagnostic test are given below.

(i) Planning

The unit, on which a diagnostic test is based, requires a detailed exhaustive content analysis. It is broken into learning points without omitting any point. The diagnostic procedure is based on the premise that mastery of the total process cannot be stronger than that of the weakest link in the chain of related concepts and skills. Accordingly each concept, skill or learning point called into play is identified at the time of constructing the test.

As far as a diagnostic test is concerned, it is not very necessary to. know the relative importance of the learning points. All the learning points have to be covered in an unbroken sequence. Each learning point should have an adequate number of questions to help identify the area of weakness.

(ii) Writing Items

All the forms of questions can be used for testing different learning points. However, for diagnostic purposes, short answer questions involving one or two steps, are used widely. Whatever be the form of questions, they should in general be easy, suitable for average students of that age or grade. The questions have to be specifically related to the learning points and should be such as to throw light on the weakness of the students. The question should be written in simple language. The scope of the expected answer should be clear the student.

(**iii) Assembling the test**

The questions are clubbed around the learning points, even when they are of the different forms; the learning points are arranged sequentially from simple to complex which ensures that students do not have to change their mental sets very frequently.

(iv) Providing directions and preparing scoring key

No rigid time limit need to be specified. A set of instructions clear and precise, is drafted. It should also be provided with a scoring key and marking scheme

(v) Reviewing the test

Before administering the test, it should be carefully edited and reviewed. This ensures that any inadvertent errors are eliminated.

2 Mark Questions & Answer key words

1. Write any four uses of a ‘rating scale’. (2017)

4 Mark Short Essays & Value Points

1. What are the uses of a diagnostic test. (2017)
2. Distinguish between an achievement test and a diagnostic test. (2015)