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PEDAGOGY OF MATHEMATICS

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Aims And Objectives Of Teaching Mathematics

Mathematics - Meaning and Definitions

Meaning of mathematics is that ‘it is either the science of number and space or the science of quantity, measurement and spatial relations. It is a systematized, organize and exact branch of science. It deals with quantitative facts, relationships as well as with problems involving space and form. It is a logical study of shape, arrangement, and quantity.

DEFINITION

"Mathematics is the indispensable instrument of all physical researches."
- Kant

"Mathematics is the queen of sciences and arithmetic is the queen of all mathematics".- Gauss stated

"Mathematics is the gateway and key to all sciences".

-RogerBacon

Nature of Mathematics

1. **Mathematics: a science of discovery.**
2. **Mathematics: an intellectual game**
3. **Mathematics: the art of drawing conclusions**
4. **Mathematics: a tool subject.**
5. **Mathematics: a system of logical processes**
6. **Mathematics: an intuitive method.**

scope of Mathematics

-Logic

-Structuer

-Number System

-Abstrac

Levels Of Mathematics

Applied Mathematics

Basic Mathamatics

Basic Mathamatics

[i]**Algebra** - Analytical geometry, Trigonometry, Combinatorial geometry, differential and Algebraic Geometry etc.

[ii]**Set theory** –Origin and definition, fundamental set concepts, postulates of axiomatic set theory, etc.

[iii]**Topology** – General topology, Topological groups, Differential topology, Algebraic topology

[iv]**Algebraic System**- Groups, Rings, Field, Vector Spaces.

[v]**Analysis**- It includes Real and Complex analysis, Functional Analysis, Differential Equation, Fourier, Theory of Probability, Vector and Tensor.

Applied Mathematics

(a) Calculatory Science – It includes numeral notations, calculating aspects of algebra, calculating use of tables and graphs, geometrical aids, mathematical models, analogic, computation, digital computations etc.

(b) Statistics- Basic principles,Estimation, Hypothesis testing structure etc.

(c) Numerical analysis.

(d) Mathematical theory of optimization

(e) Automation theory

(f) Information theory

(g) Mathematical aspects of physical theories.

Aims of teaching Mathematics

1. To enable the students to solve mathematical problems of daily life.
2. To enable the students to the development of culture and civilisation.
3. To develop thinking and reasoning power of the students.
4. To prepare a sound foundation needed in various professions such as those of engineers, bankers, scientists, accountants, statisticians etc.
5. To prepare the child for further learning in mathematics and the related fields.

Objectives of teaching Mathematics

(1) Knowledge Objectives
(2) Skill Objectives
(3) Appreciation Objectives

Need and significance of teaching Mathematics

(i)Mathematics for Life

(ii)Mathematics as a part of Cultural Heritage

(iii)Mathematicsfor the Workplace

Values of teaching Mathematics

(i)Practical or utilitarian value,

(ii)Disciplinary value,

(iii)Cultural value.

Lesson Plan Meaning

A lesson plan is the instructor's road map of what students need to learn and how it will be done effectively during the class time. Before planning the lesson, it is needed to identify the learning objectives and then design appropriate learning activities and develop strategies to obtain feedback on student learning.

Steps in planning a Lesson

Herbartian formal steps for lesson planning are as follows

1. Preparation
2. Presentation
3. Association and comparison,
4. Generalization
5. Application
6. Recapitulation

Goals in lesson plan

1. Subject matter in the lesson plan should be according to the time for teaching at the disposal of the teacher.

2. Provision of homework related to the subject matter taught should be there.

3. It should provide maximum participation of the child in the teaching and learning process.

4. In the lesson plan there should be proper provision of the teaching aids and good illustrations.

5. In the lesson plan there should be proper provision of recapitulation to have view of evaluation of the subject matter taught to the students.

Designing a Lesson Plan

"To every teacher I would say, always plan out your lesson beforehand but do not be slave to it"

- R.L. Stevenson

"To Teach we must use experience already gained as starting point
of work". - Ryburn

Bloom's Taxonomy of educational objectives

(i)cognitive domain,
(ii)affective domain
(iii)psychomotor domain.

Cognitive domain

- Knowledge : Recalling information
- Comprehension :Understanding and interpreting information
- Application :Applying procedures/systems/rules in specific situations.
- Analysis :Breaking a system down into its const
  ituent elements.
- Synthesis :Bringing elements together to form a new, coherent whole
- evaluation :Making judgments/critical comparisons on the basis of agreed Criteria

Affective Domain

Receving	Developing **an awareness of something**
Responding	Showing active interest in something.
Valuing	Committing oneself to taking up an attitudinal position. Showing active interest in something.
Organization	Making adjustments or decisions from among several alternatives
Characetrization	integrating one's beliefs, ideas and attitudes into a total, all- embracing philosophy.

psychomotor domain

Gross body Movements	Movements of arms, shoulders, trunk, feet and legs
Finely-Coordinated Movement	Movements of hand and fingers, hand and eye, eye and foot, etc.
Non-Verbal Communication	Facial expressions gestures, bodily movements.
Speech behavior	sound production and projections sound/gesture coordination

Types of test – Items

1. Multiple-Choice Tests
2. True-False Tests
3. Matching Tests
4. Essay Tests
5. Short-Answer Tests
6. Problem sets
7. Oral exams

Constructing test-items for formative evaluation in class General steps

to

1. Identify and define the learning outcomes be measured
2. Prepare test specifications
3. Construct relevant test items
4. Review and edit the items
5. Arrange the items in the test
6. Prepare directions

Unit – III: Practicing the teaching skills in Mathematics

Meaning of Teaching

Teaching includes all the activities of providing education to other. The person who provides education is called teacher. The teacher uses different method for giving best knowledge to his students. He tries his best to make understand students. His duty is to encourage students to learn the subjects. Teaching means interaction of teacher and students. They participate for their mutual benefits. Both have their own objective and target is to achieve them.

Teaching skills -Meaning

Teaching skills would include providing training and practice in the different techniques, approaches and strategies that would help the teachers to plan and impart instruction, provide appropriate reinforcement and conduct effective assessment.

Teaching skills

1. Skill of Introducing

This is an important skill required for a teacher. Well begun is half done is a saying which indicates the importance of introducing a lesson.

components of skill of Introducing

1.presentaion of theory
2.modeling
3.planning
4.performance
5.percentation
6.feedback
7.integration of teaching skill

2. Skill of Explaining

In classroom the teacher explains ideas and concepts. It is the most commonly used skill and is the essence of instruction.

Components of skill of explaining

1. Clarity
2. Continuity
3. Relevance to content
4. Covering essential points
5. Simple
6. Relevant and interesting examples
7. Use of inducts, deductive approach.

3. Skill of Questioning

Successful teaching highly dependent on questioning technique employed in the teaching sessions.

Components of skill of questioning

- Prompting
- Seeking Further Information
- Refocusing
- Redirection
- Increasing Critical Awareness

4. Skill of closure

This skill is useful for a teacher to close his teaching properly. The teacher is to summarise all the teaching during the period and provide opportunities for the students to correlate the learnt matter with the past and future knowledge.

5.Skill of Reinforcement

The skill is being used to utilize good behaviours of the learners and to avoid the undesirable behaviours of the learners.

Components of skill of Reinforcement

Positive Reinforcement - Good, Very Good, Yes,

Appresation etc.

Negative Reinforcement - Punishment

6. Skill of varying the stimulus

Varying the stimulus is described as a deliberate change inthe behaviours of the teacher in order to sustain the attention of the learners throughout the lesson.

components of varying the stimulus

1. Movement
2. Gestures
3. Change in voice
4. Focusing
5. Change in interaction pattern
6. Pausing
7. Student's physical participation
8. Aural visual switching

7. Non – verbal cues

Non-verbal communication has been defined as communication without words. They are usually made with the help of the movements of the eye, hand, head, body, and facial expressions.

Components of non-verbal cues

Positive non-verbal cues –

(smiling, nodding the head, a delighted laugh, patting on the shoulder, asking the students to clap. The students can be asked to clap their hands for correct answers given by a student.)

Negative non-verbal cues –

(staring, looking angry, shaking the head, beating, caning, bruising, raising the eyebrows, tapping foot impatiently and walking .)

8. Fluency in communication

Communication in general is a process of sending and receiving messages that enables humans to share knowledge, attitude, and skills.

MINI-LESSON

* It is a teaching training technique for learning teaching skills.
*It is a short lesson that can be taught in just a few minutes
*This practice may take only 20 minutes
*two or more skills used

Steps In Mini-lesson Plan

*Motivation

*Presentation

*Interaction

*Reflection

*Summing-up

THANKYOU