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**PSS 6: Teaching of mathematics**

**AIMS AND OBJECTIVES OF TECAHING MATHEMATICS**

Teachers need to well aware about the different aims and objectives of Mathematics teaching. A teacher who has sufficient knowledge on these aspects would be able to develop various skills among his/her students. Let us discuss the aims and objectives of teaching Mathematics.

- **Aims of Teaching Mathematics**

First of all let us try to understand the difference between goal, aim and objective of teaching Mathematics. The term 'aims of teaching Mathematics', stands for the goal or broad purpose that needs to be fulfilled by the teaching of that subject in the general scheme of education. Goals and Aims are like ideals, and their attainment needs long term planning. Therefore, they are divided into some definite and workable units named as objectives. The specific objectives are those short term, immediate goals and purpose that may be achieved within the specified classroom transactions" (NCERT, 2012). Thus we can conclude that aim is more broad, comprehensive and general in nature while objectives are means to achieve the aim.

According to NCGF-2005, the main goal of Mathematics education in school is the mathematization of minds of children.

- **Objectives of Teaching Mathematics**

We understood that aims are ideal general statements that are broad and comprehensive. Also aims are not definite and clear and require long term planning to achieve. In such a case, we move on to a more clear, achievable and workable units called objectives. Objectives are definite, clear, narrow, specific and can be attained in a short duration.

There are two types of objectives of teaching: general and specific. General educational objectives are broad and related to school and educational system.

Following are the general objectives of teaching Mathematics at secondary level.

**The students will be able to**: • Acquire knowledge of facts, concepts, theories, laws, principles, proofs of Mathematics; • Develop the ability to communicate mathematical ideas with precision and accuracy;

• Develop inertest and positive attitude towards Mathematics;

• Apply mathematical knowledge to solve real life problems;

• Develop the skill to use algorithms in problems solving;

• Appreciate the contributions of mathematicians;

• Develop mastery of algebraic skills, drawing skills, deducing interpretations, finding patterns, making connections, analyse, organise data, reasoning, critical thinking, etc.

Specific objectives are short term immediate goals or purposes that may be achieved through classroom instructional/educational process. Thus we may call such a objective as educational objective/instructional objective. In the case of classroom instructions, teacher is concerned about bringing changes in the behaviour of learners and we call that specific objective as behavioural objective. Behavioural objectives are the objectives that written in behavioural terms. It explains the change in state of behaviour of an individual on completion of a learning activity.

As we discussed earlier, educational processes aspire for bringing behavioural changes in an individual. Bloom has classified the change in behaviour in three domains or categories namely; cognitive domain, affective domain and psychomotor domain. Bloom (1956) had organised various educational objectives in a hierarchical order and we call it as Bloom's Taxonomy of Educational Objectives. The educational objectives falling in each domain is hierarchically placed in ascending order of complexity. Even though, many taxonomies are available the most acceptable and widely used one is Bloom (revised) and others for cognitive domain; by Krathwohl for affective domain and Dave for psychomotor domain.

| **Cognitive Domain** Bloom(1956) | **Affective Domain** Krathwohl, Bloom Masia (1973) | **Psychomotor Domain**) Dave( 1975) |
|---|---|---|
| Knowledge | Receiving | Imitation |
| Comprehension | Responding | Manipulation |
| Application | Valuing | Precision |
| Analysis | Organization | Articulation |
| Synthesis | Internalizing Values ( Characterization) | Naturalization |
| Evaluation | | |

Keeping in view the context of objectives of teaching Mathematics let us briefly discuss the taxonomy of educational objectives. It is the duty of the teacher to first locate different learning (specific) objectives pertaining to the topic/concept that he/she is going to teach. After deciding the learning objective, the different learning experiences/activities and assessment mechanisms are chosen. Thus the learning objectives are written with the help of action verbs that are clear and specific. The action verbs give the direction to the teacher about 'what the children will do' or 'what the learners are expected to do' after completion of the learning activity. Thus, with each learning objective, action verbs and specifications are associated. Now let us discuss the learning objectives belonging to different domains.

**Cognitive Domain:** Cognitive means 'knowledge'. The levels falling under cognitive domain are as follows:

**Remember:** ‘Remembering' is the lowest level objective of cognitive domain. It refers to the ability to recall information of facts, concepts, theories, laws, patterns, structures, generalizations, etc. A child who has the ability to recall mathematical information would be able to proceed to acquire highest learning.

**Examples:** recalling the definition of rectangle, formula for finding the area of rectangle.

**Understand:** It is the next higher level of cognitive domain. Understanding helps learners to correlate, connect and develop meaning from new material.

**Example:** describing the method of calculating area of rectangle.

**Apply:** The learner is able to apply different facts, concepts, theories, laws or principles in new situation. Application subsumes both knowledge and understanding.

**Example**: applying knowledge of calculating area of rectangle to find the area of own house of the learner.

Analyze: Analysis is the breaking down of a complex situation in to different parts/elements. At such a stage, the leaner will be able to locate the elements, differentiate, recognize relationship, and identify patterns pertaining to a situation.

**Example:** identify the causes of splitting the following figure into different parts for calculating its total area.

Aims and Objectives of Evaluate: Evaluation represents the learner’s ability to formulate hypothesis, critique, and judge a material, situation or method against the standard, which may be internal or external to it. Evaluation is the most complex mental process belonging to cognitive domain.

**Example:** justifying the need for constructing ‘rooms’ in rectangular/square shapes.

Create: As the word implies creating stands for collecting information, designing and putting elements together to construct a new pattern or develop theory out of it or to build up understanding of the concept in detail.

**Example:** making a rectangular shaped house using thermocol sheet.

**Affective Domain**: It deals with the emotional aspects of the learner. The various emotional states of an individual like different feelings, motivation, interest, attitude, values, appreciation, etc fall under affective domain. Similar to cognitive domain, the learning objectives of affective domain are hierarchically ordered i.e. from simple to complex. The learning objectives pertaining to affective domain are given below:

**Receiving:** Receiving is the lowest level objective of affective domain. Receiving refers to the learner’s ability to listen and receive a situation, stimuli, phenomenon, information, etc. For example, listening to the teacher’s lecture on the topic ‘area of rectangle’.

**Responding:** In this stage of mental process, the leaner starts responding to different situations, information and stimuli. For example, asking teacher the difference between perimeter and area of the rectangle.

**Valuing**: Valuing involves increasing internalistaion of the worth or value a person attached to a particular object, phenomenon or behaviour (NCERT, 2012). For example, showing interest in solving problems related to rectangle.

**Organistaion:** Organistaion is the fourth level objective which brings together different values, resolving conflicts between them, starting to build an internally consistent and a unique value system or attitude (NCERT, 2012). For example, showing the attitude to solve mathematical problems by self.

**Internalising Values (Characterisation):** Characteristaion is the highest level objective in which the values and attitudes of an individual is attained to help to control his/her behaviour. The personal, social and emotional behaviour of an individual reflects his/her attainment of values. For example, while solving mathematical problems, maintaining patience till he/she reaches answer.

**Psychomotor Domain**: Psychomotor domain includes the ability to use body parts to accomplish tasks, neuro muscular movements and types of body actions. The psychomotor skills can be observed while playing, typing, stitching, etc. Psychomotor skills are developed through practice and are measured in terms of speed, precision, accuracy etc. The objectives belonging to psychomotor domain are given below:

**Imitation**: Imitation is the lowest level objective of psychomotor domain. At this stage, individual observes actions and are practiced/repeated/simulated at his/her mental level. Later, the individual performs those actions but with less precision. For example, constructing a rectangle by using matchsticks.

**Manipulation:** Manipulation involves listening to other's directions, selecting certain actions in preference to others and practicing those actions for accuracy and perfection. For example, listening to the teacher and build a rectangle as per the teacher's advice.

**Precision:** The third level objective of psychomotor domain implies the development of motor skills with exactness. At this stage, the control over actions helps him/her to develop required motor skills with precision. For example, assembling various objects, take measurements and then construct a rectangle with accurate measurements.

**Articulation**: Articulation involves control over multiple motor skills in a logical and systematic way which help individual to complete the desired action. High level coordination of various motor skills is developed at this stage. For example, to construct a rectangle, firstly, the items needed are collected, measurements are taken, the procedures are followed and jotted down then finally the rectangle is made in a sequential order.

**Naturalistaion:** The highest level of psychomotor domain, at this level, motor skills and coordination of movements becomes the reflex actions/mechanical. While performing any action, the individual naturally performs with precision and accuracy.

For example, when children are asked to construct a rectangle, automatically the materials required comes to their mind, and they succeeds in constructing it.

Formulation of objective will guide you in your teaching learning process and in turn help children to achieve the desired learning outcomes.

Now we may discuss few of the general aim and objectives in detail like mathematisation of mind of children, enhancement of reasoning power and visualization, developing problem solving skills and critical thinking in Mathematics.