
UNIT 3 METHODS OF TEACHING MATHEMATICS

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3.1 INTRODUCTION

In the previous units of this block, the why and what of teaching mathematics have been discussed. These questions are basically related to planning the curriculum. The classroom teacher may not be directly concerned with these questions but he can certainly seek direction while he plans to teach. What is the best method to teach a certain subject? or, how can I enable children learn mathematics? are some of the questions for which every teacher has to find a solution. Different methods of teaching mathematics have been proposed by different educators. Knowledge of these methods may help in working out a teaching-learning strategy. It is not educationally sound for a teacher to commit himself to any particular method. A teacher should adopt an approach considering the nature of the children, their interests and maturity and the resources available. The merits and demerits of various methods listed in this unit should guide a teacher and help him/her to improve his/her teaching skills. In this Unit the following methods have been discussed:

1. Lecture Method
2. Playway Method
3. Inductive-Deductive Method
4. Heuristic Method

3.2 OBJECTIVES

After studying this unit, you should be able to:

- identify different methods of teaching mathematics;
- select appropriate teaching-learning strategy keeping in view the maturity level and interest of children at primary stage of education;
- encourage the activity and the playway methods to make learning of mathematics more interesting and meaningful for children.

3.3 METHODS OF TEACHING MATHEMATICS

3.3.1 Lecture Method

As the name indicates, in this method the teacher speaks all through the lesson and the pupils listen attentively and silently. The teacher may not even use the blackboard or any other teaching aid. He does not allow students to raise their doubts or ask any question seeking clarification for any of the points mentioned during the lecture. Students take down notes for the important ideas and later memorize them.

Lecture method is useful in introducing new topics. Mathematics is based on previous knowledge of facts. This method can be used to teach a topic requiring some previous knowledge of facts. Also a large number of facts can be presented in a short period of time. At times, when the knowledge of some units in textbooks is not sufficient, then the lecture method by teachers can be used. The matter to be presented should be selected according to the level of students.

Example

At primary level, to calculate the simple interest (S.I.) on a given principal for a fixed time at a particular rate of interest, the formula for calculating the S.I. should be given to the pupils. The introduction of this topic can be done successfully

through the lecture method by first stating the formula $S.I. = \frac{P \times R \times T}{100}$ and then

making pupils identify the terms used here. The teacher should then guide the pupils to apply the formula in different situations. This will help the students to retain the formula in their minds.

In order to prepare a good lecture, many points should be taken into consideration like: (1) the lecture must be well organized. (2) after every general statement an example should be there (3) the lecture must proceed from simple to complex.

This method takes the form of "one man's (the teacher's) show" where the students remain passive listeners. Since the study of mathematics should ultimately encourage thinking and reasoning and should not end with memorizing bits of information through repeated practice or drill, this method is not suitable. In this method, child's participation, experimentation and scope for enabling him to discover/explore are totally neglected. This method should be followed with care and for limited objective only as and when the teacher finds it unavoidable.

Check Your Progress

Notes: a) Write your answers in the space given below.

b) Compare your answer with the one given at the end of this unit.

1. When should we use the lecture method?

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2. What are the disadvantages of the lecture method?

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3. Which points are to be considered while preparing a good lecture?

3.3.2 Playway Method

Play is a natural instinct of the children. It has been effectively used for teaching. While playing pupils recognize their own needs, they help in planning activity, accept guidance, and set up their own goals. Through their mutual cooperation and participation, maximum amount of learning results. During play, learning becomes real, interesting and easily adjustable to individual needs. Learning process becomes interesting and the atmosphere is more free, informal and familiar for children. Playway method helps in developing desirable attitudes and skills. It gives confidence to learners. Many types of games and toys are now available to children which have their roots in mathematical concepts ideas. These games use patterns, quizzes and puzzles. Many types of dominoes, number checkers, counting frames, patterns of magic squares, puzzle boards or blocks are now commercially available. These may be effectively used for teaching in the classroom.

3.3.3 Inductive-Deductive Method

Mathematics in the making is experimental and inductive. Induction is that form of reasoning in which a general law is derived from a study of particular objects or specific processes. The child can use measurement, manipulator or constructive activities, patterns etc. to discover a relationship which he shall himself, later, formulate in symbolic form as a law or rule. The law, the rule or definition formulated by the child is the summation of all the particular or individual instances. In all inductions, the generalization that is evolved is regarded as a tentative conclusion.

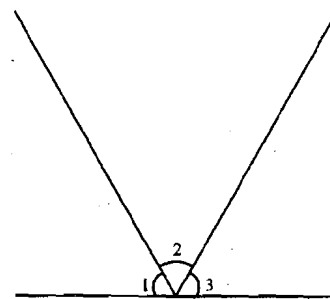
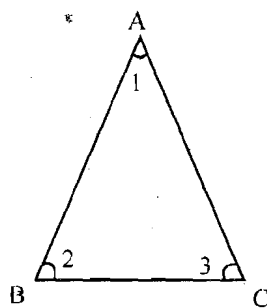
Example 1

Ask pupils to draw a number of triangles. Ask them to measure the angles of each triangle and find their sum.

Conclusion

The sum of 3 angles of a triangle is 2 right angles (approximately).

You can ask children to cut the three corners of the triangles and put them at a point so that they form a linear.



Example 2

$$3+5=8$$

$$5+7=12$$

$$9+11=20$$

Conclusion

Sum of two odd numbers is an even number.

In deduction the law is accepted and then applied to a number of specific examples. The child does not discover the law but develops skills in applying the same, proceeds from general to particular or abstract to concrete. In actual practice, the combination of Induction and Deduction is practised. The laws discovered by pupils inductively are further varified deductively through applications to new situations.

Inductive Method

1. Proceeds from the particular to the general; concrete to abstract.
2. It takes care of the needs and interests of children. It is a developmental process.
3. It encourages 'discovery' and stimulates thinking.
4. The generalization or rule is formulated by the child, therefore he remembers it with ease.
5. The how and why of the process is made clear through reasoning.
6. It starts from observation and direct experience and ends in developing a rule in abstract form.
7. It encourages child participation and group work.

Deductive Method

1. Proceeds from the general to the particular, the abstract to the concrete.
2. Facts are thrust upon the child. The principle of growth is not considered.
3. The authority decides or gives the formula and encourages memorization.
4. The rule is given to the child. He does not appreciate its nature and is likely to forget it easily.
5. The process is taken for granted and accepted without reasoning.
6. Does not encourage learning by doing; it starts with a rule and provides for practice and applications.
7. It demands individual learning and treats the child as a passive recipient.

3.3.4 Heuristic Method

This method can also be named as the 'discovery method'. It is in contrast to the lecture method. Instead of merely the teacher telling everything the student finds out everything for himself. It demands complete self-activity of self-learning on the part of the student. Through this method, the student learns to reason for himself. The teacher is not even required to guide, help or encourage the student. This method helps in the development of a scientific attitude in the learner. It develops self confidence, originality, independence of judgement and thinking power in the learner to make him an ever successful student.

Practically speaking, this method in its extreme form is not appropriate and desirable. The child after all is a child. He is ignorant about various activities. Most of the things are new to him. He needs guidance and in certain situations he

may need the teacher's assistance at every step. It is true that the student should overcome his difficulties by his own efforts as far as possible, but the teacher's help should not be denied when he needs it. Given below is an illustration how do we go about this method.

Topic : Volume of a Cuboid

Class : V

Let the problem be of finding out the volume of a cuboid of dimensions l cm \times b cm \times h cm.

The teacher should remember that he has to elucidate the process from the students. The teacher has to put questions in such a way that he leads the students to discovery.

Q.: To determine the volume, what is to be done?

Ans. The child should say that they need a number of unit cubes. Using the cubes, they will make the given solid or they fill up the entire space of the solid with the cubes. Later, they will count the unit cubes.

Q.: How many cubes did you use in all?

Ans. 18 cubes..

Q.: Can you now give me the volume of the cuboid?

Ans. Yes, 18 cu. cm.

Q. : Why 18 cu. cm and why not 18 cm?

Ans. 18 cubes each of 1 cu. cm volume have been used. So, volume of the cuboid is 18 cu. cm.

Despite the fact that this method allows the learner to become an active participant in the learning process; creates in the learner a spirit of inquiry; makes the learner self-reliant; allows the learner to acquire a real understanding and clear notion of the subject; it has limitations for its use in primary classes because of classes being of large size, resources being poor and teacher competence being not satisfactory.

3.4 BASIC PRINCIPLES OF PLANNING INSTRUCTION

Each of the methods discussed above have their distinctive place in teaching. However none of them is always appropriate. An elective method formed by a combination of certain elements of each of these is, therefore, followed in practice. A few common points which have been accepted concerning procedures formulating a sound instructional strategy are as follows:

1. Make certain that pupils are ready for new work before it is presented.

The teacher should know which concepts, skills are necessary as a background to the new content. Review work should be given on an individual or small group basis until the basic understandings are developed. In mathematics as the learning proceeds the relationship to ideas/skills already understood should be established.

2. Use concrete materials to introduce and to develop processes until the concepts and principles involved are understood. In primary classes, work with concrete materials must be carried to such mature levels of thinking that the meanings of processes are clearly understood. Drill or practice alone does not make learning meaningful.

3. Encourage pupils to discover new steps and processes, not just perceive the procedures involved. Children who discover for themselves meanings and applications of number will be better able to use their knowledge to solve problems and to approach new learning. Activities and situations which help the child make his own discoveries are of great value.
4. Postpone repetitive practice or drill for skill until the meaning of the processes involved has been fully understood by pupils.
5. Adapt content methods and materials to the needs, interests and levels of development (or growth) of the pupils.
6. Wherever possible, use visual aids and community resources to supplement the content given in the textbooks.

Check Your Progress

Notes: a) Write your answers in the space given below.

b) Compare your answer with the one given at the end of this unit.

4. How is Playway method more effective than the Lecture method?

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5. Give any three differences between Inductive method and Deductive method.

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6. What basic principles should be considered by a teacher to adopt a method in teaching?

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3.5 LET US SUM UP

Several methods have been suggested and discussed in the previous section but all of them are not equally appropriate and suitable for use. The teacher, after knowing about all these methods, their merits and demerits, should be able to make his own method by imbibing the good qualities of all the methods. Methods like inductive-deductive, playway are reasonably appropriate and suitable for the teaching of mathematics at primary stage. The method finally adopted by the teacher must i) ensure maximum participation of the child, ii) proceed from concrete to abstraction, iii) provide knowledge at the understanding level and not merely on memorization level.

3.6 UNIT-END EXERCISES

1. What is the most appropriate method of teaching mathematics particularly at the primary stage? Support your preference with arguments.
2. Illustrate and discuss the inductive-deductive method of teaching by selecting one topic/sub-topic.
3. What method(s) do most teachers of mathematics adopt at present? What are their drawbacks and how can improvement be brought under the prevailing conditions?
4. Playway method is considered to be an effective method for teaching of mathematics. Justify.
5. Why has NPE'86 stressed, the overall use of child-centered activity method? How does it ensure better and permanent learning?

ANSWERS TO CHECK YOUR PROGRESS

1.
 - i) To introduce a new topic
 - ii) To get the expanded knowledge of units which are not clarified in textbook
 - iii) To present a large number of facts in a short span of time
2. It is a one way process. There is no interaction between the students and the teacher. It neglects pupil's interests and his/her participation.
3.
 - i) Lecture must be well organized,
 - ii) It should proceed from the simple to the complex,
 - iii) Every general statement or fact used must be accompanied by an example
4. Lecture method neglects pupil's interests, and his/her participation where as playway method encourages mutual cooperation and participation among the students. Playway method makes learning process more interesting and gives confidence to the learner.
5.

Inductive method	Deductive Method
<ol style="list-style-type: none">i) A large number of simple examples are given to introduce a particular concept.ii) Chances of forgetting will be less.iii) It encourages child participation.	<p>The topic is introduced straightaway and concept is applied to different examples.</p> <p>Chances of or getting will be more.</p> <p>It needs mere following and no imagination is ignited.</p>
6.
 - i) Before introducing a new topic, review work of previous fact/ knowledge should be done.
 - ii) Proper teaching aids should be used to make the learning process more interesting.
 - iii) Individual activity of pupils should be encouraged.