



UNIT 3 METHODS OF LEARNING AND TEACHING

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3.0 INTRODUCTION

In the previous unit you have learnt the concept, process and different approaches to teaching and learning. However, to make the teaching-learning effective in classroom transaction process there are several means and techniques which being a teacher you may be familiar with. In this Unit different techniques and methods used in classroom teaching-learning process are discussed with a view to highlight how these can be made contextually appropriate and relevant.

For understanding the concepts and methods discussed in this Unit, you will need approximately *14 study hours*.



3.1 LEARNING OBJECTIVES

After completing this unit you will be able to:

- List the characteristics of effective methods used in teaching-learning situation.
- Categorise methods of classroom transaction from a set of given situations.
- Describe procedure and steps of instructional methods and student-centered methods in detail.
- Use/adopt different methods appropriate to specific teaching-learning situations.

3.2 EFFECTIVE METHOD OF TEACHING-LEARNING

A specific teaching-learning situation is narrated below. Please go through it and try to find answers yourself to the questions that follow it.

Situation 1: *Mr. Subir is a science teacher. He was teaching Science in Class VI for the last three months. On different occasions, he tried his best to make his lessons interesting to the students. He brought different types of materials to the classroom, conducted several experiments, encouraged students to observe the natural phenomena and used several such other activities to make students learn effectively. He was curious to know how far he has been successful in his efforts. He was not sure whether the methods he was employing were really beneficial to the students. A number of queries as given below came in his mind:*

- *Was he able to:*
 - *generate students' interest in learning Science spontaneously?*
 - *cater to the individual needs of the students?*
 - *match the mental ability of the students?*
 - *develop students' self confidence and self discipline?*
 - *encourage creative thinking of the students?*
 - *help the students to organise their knowledge ?*
 - *encourage students to participate more in the learning process?*
- *Whether the students learn better by doing something?*

You may have used several methods in your classes. With respect to any method that you have used recently, reflect on the above questions and judge the effectiveness of



your teaching. This will help you to have an idea about the *characteristics of an effective method of teaching and learning* which are as follows:

- Creates interest in children so that they will participate actively in the teaching learning process and can continue to learn more.
- Matches the mental ability and needs of the students.
- Gives emphasis on students' experiences.
- Provides a scope for peer learning.
- Provides a scope for learning something by doing.
- Encourages students to think independently and construct knowledge of their own.
- Develops creative thinking of the children.
- Provides a scope for development of life skills in children.
- Flexible i.e., instead of following a single method for teaching of all topics, different methods may be followed during the teaching learning process.
- Inexpensive.

3.2.1 Classification of Methods

Let us consider two different classroom situations.

Situation-2: *Mr. Ramesh was teaching Science in class -III .The topic was on 'Pollution of water'. The students were sitting in rows in the classroom. Mr. Ramesh was standing in front of the students and explaining the causes of pollution of water. While explaining, he showed different pictures to indicate the causes of water pollution at different sources. He never tried to find out whether the students could make any sense out of that. Then he asked some questions to the students. Some of the students were able to answer the questions. At the end of the class he gave homework from the exercise given in the textbook.*

Situation-3: *Ms. Sarita was teaching the same topic in other section altogether in a different way. She divided the students in different groups and asked each group to sit in circle. She provided pictures to each group indicating causes of pollution of water at different sources. Then she instructed to the students to observe the pictures and write down the causes of pollution of water at different sources by discussing among themselves in groups. Ms. Sarita was watching whether each student was participating in the discussion or not. Then the group leader of each group presented the theme assigned to them. While one group was presenting, the other groups were listening to them and after presentation they were giving their opinion. Finally, Ms. Sarita consolidated the theme with the help of the students.*



Write down the role of the teacher and the role of the students in both the situations.

Situation 2		Situation 3	
Role of the teacher	Role of the students	Role of the teacher	Role of the students

Now answer the following questions:

- In which situation is the teacher’s participation more focused?
- In which situation is the students’ participation more emphasized?

In the first situation, the teacher performs everything such as: explaining the theme, using the teaching learning material i.e. pictures, asking questions etc. Less importance is given on students’ participation. On the other hand, in the second situation, the teacher acts as a facilitator of learning. She guides and helps the students at the time of their need. The students are active participants in the teaching-learning process.

So, on the basis of the role of the teacher and the student in the teaching-learning process the methods can be classified into two major categories, i.e. **Instructional Methods and Student Friendly Methods**. The first situation is the example of instructional method and the second situation is the example of student-friendly method. Further, these two methods can be classified as shown in the tree diagram given below:

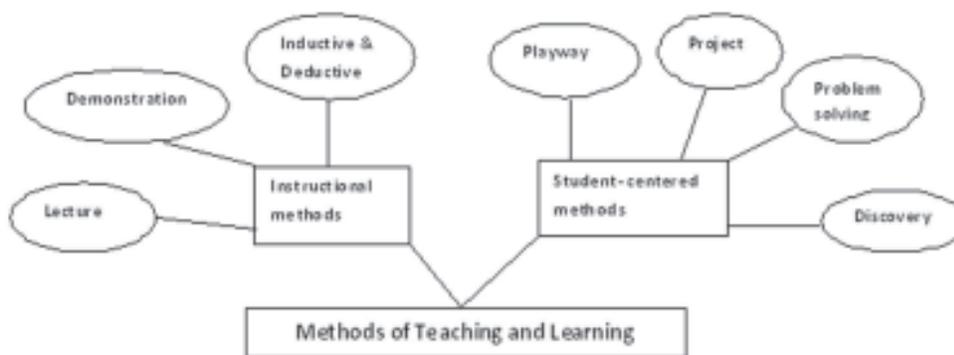


Fig 3.1 Two Categories of Methods of Classroom Transaction

3.3 INSTRUCTIONAL METHODS

We all have experience about instructional methods as very often we teach or instruct the students in the class. These methods are very common to us. Sometimes we explain



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facts, concepts, theories and principles. Sometimes we explain with demonstration of certain pictures, charts, models, and experiments and sometimes instruct our students to perform some activity like respond verbally or in writing to question we pose to them. In these methods as a teacher, we are more active in teaching and instructing while the students are more passive and acting in a limited way only when they are directed by us. Some of the examples of instructional methods are:

Lecture method, Inductive-deductive method, Discussion method, Lecture-demonstration method.

3.3.1 Lecture Method

Read the following situation.

Situation 4: Ms. Lilima is teaching a Science topic i.e. ‘Our Food’ in class IV. She is explaining different types of food we eat and their components .She is writing the main points such as protein, carbohydrates, and fats on the blackboard. The students are listening with attention and writing down the main points written on the blackboard. After explaining the topic she starts asking some questions to the students. Some students answers the questions while some remain quiet. She corrects the wrong answers of the students where necessary and praises those who give correct answers.

What method is Ms. Lilima following?

Well, she is following the ‘Lecture Method’.

As a student you have such experiences in your school and college. As a teacher you also have some classroom experiences where you teach your students by this method. Reflect on your experience and list the activities of the teacher and the students in a lecture method in a classroom situation.

1.
2.
3.

Characteristics of lecture method:

- The teacher instructs or gives lecture on a topic for all most the complete time in the period.
- The teacher provides information, concepts, facts, events, theories, laws, principles etc.
- Sometimes he/she uses blackboard during his / her lecture and asks questions to the students.



- Students are passive listeners. Their activities during the lecture period, at best, is taking down some notes and responding to occasional questions of the teacher.
- Within a single period, the teacher may unwittingly present more information than students can absorb, and the method provides no accurate means of checking student progress. Teacher presents the subject matter at his own speed.
- Content is presented as a whole and the students learn through listening and memorization.



ACTIVITY-1

Write the merits and demerits of lecture method. Discuss and share the same with your fellow students and tutor at the study centre.

This method can be successfully used in imparting factual information, explaining the theoretical points which cannot be demonstrated, summarizing and recapitulating certain topics etc. in higher classes. But this method seems to be not relevant for teachers and students of elementary classes.

3.3.2 Demonstration Method

Recall the situation of a practical class in a science laboratory and write down what you do there from beginning to end.

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It is evident that you demonstrate some experiments using some apparatus and materials while simultaneously discussing about the experiment with the students.

As a teacher you know that various simple experiments have been presented / written in the science textbooks for elementary level. These experiments can also be done in the classroom and explained simultaneously. This way of teaching is known as ‘*Demonstration method*’ or ‘*Demonstration-cum-discussion method*’ or sometimes ‘*Lecture-cum-Demonstration method*’.

Demonstration method is a teacher- centred method as the teacher demonstrates the pictures/ charts/models/experiments and explains the principles, concepts involved in these demonstrated materials or processes. The students observe the demonstration shown by the teacher and some of them participate in answering the questions asked by the teacher and draw conclusions.



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Let us consider another situation.

Situation 5: *Ms. Sheela, the science teacher, was to teach 'Absorption of Water by Root' in Class V. For this, Ms. Sheela thought of doing a simple experiment and collected the required materials like flowering twigs (e.g. balsam plants), glass tumbler, water in the tumbler, and ingredient for colouring water. She demonstrated the experiment by inserting the root of the flowering twig in red coloured water kept in the glass tumbler. She did the experiment by explaining its process simultaneously. During her demonstration, she wrote some key words and drew a labeled diagram of the experiment on the blackboard. Then she asked the students about what they observed when the roots of the twig was dipped into red coloured water for some time and what conclusion they arrived at from this experiment.*

**ACTIVITY-2**

From the above example list the steps involved in the Lecture-cum-Demonstration method. What do you think is the criteria for good demonstration in the classroom?

Steps involved in the demonstration method :

- a. Planning
- b. Introduction
- c. Demonstration
- d. Blackboard usage
- e. Concepts compilation

For successful demonstration, several criteria are to be followed in each of these steps.

- **Planning:**

- Ensure whether the lesson is suitable for this method.
- Collect necessary tools, equipments, and materials for demonstration.
- Rehearse the experiment before demonstrating before the class as it will help to build confidence to demonstrate.
- Be ready with explanatory notes and questions to be used during and after the demonstration.



- **Introduction:**
 - Motivate the students to arouse interest in observing the experiment keenly and to accept new concepts after the demonstration.
 - Introduce the lesson as a ‘problem’ or an issue, so that the students understand the importance of the lesson.
- **Demonstration:**
 - Keep the curiosity of the students alive during the demonstration.
 - Take care to ensure that the students are able to follow the demonstration.
 - Relate the demonstration with the life experiences of the students.
 - Handle the instruments safely, and arrange them in their respective places for the demonstration.
- **Blackboard Usage:**
 - Write the objectives clearly on the black board to make the students understand the significance of the demonstration method
 - Draw relevant pictures and write the key concepts and the results of the demonstration immediately on the black board.
 - Ask the students to write the key points, draw the diagram and finally the results in their notebooks.
 - Check their notebooks while they are writing.

Besides the above mentioned points, you need to take care of the following aspects:

- Do tell the purpose of the demonstration to the students but do not tell the inferences or conclusions in advance.
- Seek the help of students in arranging, and performing the experiment. Quality of demonstration is better when you along with your students actively participate in it.
- Be well versed in the handling of apparatus and arrange those for the demonstration in a definite order which the students can clearly observe.
- Check that the demonstration is clearly visible to all students in the class.
- Ensure that the demonstration is simple and according to the mental level of the students.
- Supplement the demonstration with other teaching aids to make it more real and interesting.
- Ask reflective questions to stimulate the interest of the students.



Think for a while and answer the following:

E1. Under what conditions the demonstration method is suitable?

Usefulness of Demonstration Method:

Demonstration method is one of the most preferable methods of teaching because of its multiple benefits.

- It is cost effective. As the teacher demonstrates, it becomes more economical and time saving.
- The teacher explains the concepts during the experiment and so the students clearly understand the concepts of the lesson.
- During the demonstration the doubts of the students are cleared by the teacher then and there.
- During the demonstration, students get opportunities for the following:
 - Observation
 - Note making
 - Questioning
 - Drawing
 - Involving in Experiments
- It reduces distraction and promotes sustained attention among the students and paves way for useful learning.
- It stimulates learning and attempts to retain student interest.

**ACTIVITY - 3**

- (a) *Go through the elementary level science text book for any one class and list out the concepts which can be taught by using lecture-cum – demonstration method effectively.*
- (b) *From your list take any one concept or a few concepts and describe how you will teach those by adopting this method*

3.3.3 Inductive and Deductive Method

All of us learnt some basic formulae in mathematics in our school. Do you remember some of those formulae? Look at some of the formulae given below and add more formulae that you remember to the list.



- The formula for calculating the perimeter of a rectangle is $2(a+b)$ where a and b are the length and breadth of the rectangle respectively.
- The sum of the angles measures of a triangle is equal to two right angles.
- $V=s/t$ where V =speed , s = distance covered, t = time taken to cover the distance.

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As a teacher you or your colleagues might have been teaching these formulae in elementary classes. How do you teach these formulae? Find out from your colleagues who teach mathematics and how they teach these formulae.

There are some methods for teaching these formulae /rules / principles. Let us discuss these methods with examples.

Consider a classroom situation as given below.

Situation 6: *Mr. Manoj teaches Mathematics in class-VI. One day he taught the geometrical concept that ‘if two sides of a triangle are equal then their opposite angles are also equal’. For this at first he asked each students to draw three isosceles triangles ABC in their note book such that AB=AC. For first triangle AB=AC=6cm, for second triangle ‘AB’=’AC’=8cm and “AB”=”AC”=10cm. The students were then asked to measure the opposite angles of the equal sides of each triangle respectively and to write down the measurement of each angle in a table given below.*

Name of the triangle	Angle B	Angle C	Remarks
1 st triangle ABC			
2 nd triangle A’B’C’			
3 rd triangle A”b”c”			

On measurement the students found the opposite angles of equal sides are equal in each triangle. From this they concluded that if the lengths of two sides of a triangle are equal then the measures of their opposite angles are also equal.

This method of teaching which Mr. Manoj followed to teach a mathematical concept is known as *Inductive method*, or *Method of Induction*. In this method one proceeds from particular events to generalized conclusions. A formula or generalization is arrived at through a convincing process of identifying the similar elements and the conditions



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of these similarities in a number of concrete cases. In the above example, the elements of similarities are the measures of opposite angles in a triangle and the condition is that the triangle is an isosceles triangle and the concerned angles are the opposite angles of the two sides of equal length.

Let us consider another situation:

Situation 7: *Ms.Meena was teaching the same concept in geometry as Mr.Manoj. At first she stated the mathematical relationship – “if two sides of a triangle are equal then their opposite angles are also equal”. Then she explained the relationship between the measures of the two angles opposite to the equal sides of an isosceles triangle with the help of certain examples. When the students got the idea of the relationship then she gave the following problems to the students to solve using the relationship just explained to them.*

1. *If in a triangle ABC, $AB = AC$ and $\angle A = 70^\circ$ then find out $\angle B$ and $\angle C$.*
2. *In a triangle PQR, $PQ = PR$, and $\angle Q = 65^\circ$, then find out $\angle P$ and $\angle R$.*

The students applied the formula and solved the problems.

This method of teaching which Meena followed is known as *Deductive Method* or *Method of Deduction*.

In this method, the teacher uses the established formula, principle, or generalizations to solve the problem. The students proceed from general to particular, from abstract to concrete. In other words the facts are deduced or analyzed by the application of the established formula. Hence, the formula is accepted by the students as duly established fact.

**ACTIVITY - 4**

Select any one concept from the elementary Mathematics textbook and describe how it can be taught through both inductive and deductive methods.

Before continuing, answer the following:

E2. What are the differences between Inductive and Deductive methods of teaching?



E3. Some statements about inductive and deductive methods are given below. Read the statements carefully and write 'I' for Inductive Method and 'D' for Deductive Method against the statement concerned.

- a) It starts with formulae / rules / concepts etc and ends in solution of the problem.
- b) It starts with examples and ends in formulae /rules / concept.
- c) It encourages actual observation particular instances and thinking
- d) The method is suitable for lower classes of primary education
- e) This method is applicable in solving problems
- f) It is more time consuming.

From the above discussion, we can conclude that induction method leads the student to draw a conclusion after generalizing the relations observed in the concrete events/ objects or statements. Whether the conclusion drawn through induction is correct or valid cannot be verified by employing induction again. Rather it can only be ascertained by deduction. Through induction you help your students to discover the relationships or new concepts and through deduction you help them to verify the truth of the discovered relationship or concepts. Thus for effective learning both the methods should be used together as one is not complete without the other.

3.4 STUDENT FRIENDLY METHODS

Have you ever attended any teachers' training programme on joyful learning or activity based learning? If yes, do you remember what was focused most in these programmes?

In these training programmes the emphasis is given on the child-centered teaching-learning processes which intend to develop skills and abilities in individual or self-learning and problem solving in the students. In these methods the students learn by solving some real problems they confront in their day-to-day life. The teacher's role is to create a situation in which a problem may develop and help the students to identify issues, come up with tentative solutions, try those solutions and come out with the best possible solution to the problem. Play way, project, problem solving and discovery methods are some examples of student friendly methods. Let us discuss each of these methods in detail.

3.4.1 Play Way Method

All of us irrespective of our age enjoy playing games but a child's world of work is full of play. All children love to play. Play is a natural instinct of children. It is the natural expression of their needs. It develops physical, cognitive, social and emotional growth of a child. But what is the difference between play and work?



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Work and play are different. What is 'work' for one person may be a 'play' for another. Maintaining a garden is the work of a gardener for his livelihood; whereas the same work becomes a hobby for a young student to satisfy his/her creative urge. Given below is the differentiation between work and play.

Work	Play
It is considered difficult.	It gives pleasure.
It is imposed by others.	Voluntary acceptance with involvement.
Physical work brings tiredness.	Physical work turns into an enjoyable experience.
More concentration on work makes tired.	More concentration but no tiredness.
It is controlled.	There is freedom.

Here are two activities for you to do:

**ACTIVITY - 5**

Write down the name of a game you had played during your childhood. List out the rules involved in that particular game. Describe the process of playing that game stepwise. State the points that you learnt from playing the game.

**ACTIVITY - 6**

List out the concepts in different subjects which children can learn by way of playing. Discuss this with your fellow students in the study centre to add more points to the list.

Concept in Mathematics	Concept in Language	Concepts in Environmental studies

You can analyze any familiar game and think individually or in groups with other teachers regarding curricular concepts that can be integrated in the game so that the students



can enjoy playing the game and can simultaneously learn the concepts. This way of teaching is known as “*play way method*”.

What elements are there in a game due to which children learn many concepts easily even in your absence? Reflect and list the elements.

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Compare your list with the elements shown in Fig 3.2 below:

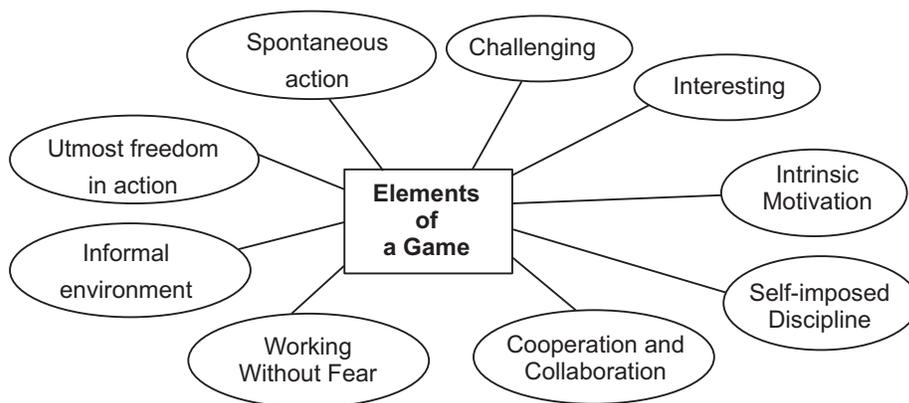


Fig. 3.2 Elements of a Game

Thus we can say that play way method has the following *advantages*:

- Playing games is a natural instinct with the young children. They not only participate in the games spontaneously, given freedom, they can organize the game effectively.
- Children can create new game; they devise the rules for playing the game and observe strictly the self-created discipline.
- This helps to nurture the creative skills of children along with the development of several life skills like problem solving, leadership, rational thinking, self-expression, communication skills, cooperative learning, group living etc.
- Learning becomes natural, joyful and energizing experience.
- It provides sufficient scope to the children to fulfill their physical, emotional and cognitive needs.
- It helps to build healthy student-teacher and student-student relationships.

**Principles of Play-way Method:**

Play way method is based on the following principles:

- ***Principle of unfolding innate potentials:*** It is an established fact that a child is born with some innate potentials which unfold as the child grows up provided favourable conditions are available for unfolding of the potentials. If unlikeable conditions are imposed on a child, the growth of such potentials slows down or in most adverse conditions they may not grow at all. Play way method aims primarily at identifying, nurturing and unfolding of the innate potentials of a child.
- ***Principle of natural instincts:*** Everyone is guided by his/her natural instincts. Play is the natural instinct of every child. Anything learnt through play appears natural to the child and he/she internalizes those experiences quickly and effectively. Play way method, therefore, recognizes this natural instinct and is used especially for young students for acquiring new experiences.
- ***Principle of complete freedom:*** A child unfolds his/her potentials and gathers more experience in less time when provided complete freedom in his/her actions. Any restriction imposed on the activity of the child curbs the natural growth. Providing complete freedom to the child is the cardinal principle of the play way method.
- ***Principle of activity:*** Research in education and psychology has established the fact that a child learns better when he/she is actively involved in doing something. Passive listening without any action only promotes rote learning. Through play the child can become spontaneously active.
- ***Principle of fulfillment of desires:*** Every child is driven by his/her inner desires and intentions which he/she may not always be able to describe. When he/she gets sufficient freedom and flexibility, he/she gets unlimited opportunities to act for fulfilling his/her intentions. On the contrary, any external imposition in terms of learning objectives may hinder the natural growth. Play way provides such freedom from any such external imposition.
- ***Principle of pleasure:*** Anything that gives pleasure is easily learnt. Moreover, all the actions of children are driven by the principle of pleasure and pain which means that a child loves to engage in activities that are pleasurable and avoids those which are painful. Therefore, learning through play way is easier, pleasurable and sustainable for longer duration.
- ***Principle of creativity:*** Children love to play but at the same time they get easily bored to play the same game for a prolonged period and look for alternatives and innovations. This desire for change propels them to devise innovations in their play. Thus the early development of the creative potentials of a child comes



through play and play way method employed imaginatively promotes growth of creativity in children.

- **Principle of responsibility:** Play enhances the sense of responsibility among children. In course of play children realize that playing randomly without any rules and discipline is not satisfying whether playing individually or in groups. Therefore, the child seeks others help in devising rules or develop in group and assume responsibility for adhering to rules during play. Thus, through play way method the children learn to be more responsible than through obeying any direct instruction.

Therefore, if you are going to use this method in your class, you have to plan in the initial stage to fulfil the needs of every child of your class and act accordingly in the classroom.

Visualize the two classroom situations given below:

Situation 8: *Ms. Sarmistha, the science teacher was teaching the concept of living and non-living things in class-III. She transacted the lesson step wise in the following manner.*

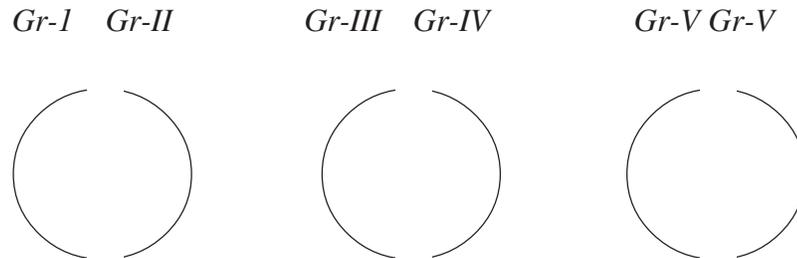
- *She divided the students into small groups. Each group consists of 4-6 students. Each group was instructed to sit in a circle.*
- *She supplied the picture cards of various living and non living things (teaching learning material) to each group. Children of each group observed the picture cards carefully.*
- *She instructed the students to find out the living things that can move from one place to another by themselves. The students of each group found as many picture cards of living things as they could and handed over the same to the teacher.*
- *With the help of students she counted the correct picture cards identified by each group separately and awarded them points for the correct responses, i.e., one point for each correct response. The total points awarded to each group were written against the respective groups in the blackboard.*
- *She returned the picture cards to respective groups and asked them to continue the game. She instructed them to identify other characteristics of living things in course of playing with cards. The game continued till all the characteristics of living things are identified.*
- *At last she consolidated the characteristics of living and non- living things with the help of the students.*



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Situation 9: Saroj tried to develop the map reading skills in students of class-IV.

- For this he divided the students into 6-8 groups. The students of each group were asked to seat in half-circle as shown in the diagram given below.



Seating arrangements

- He supplied the atlas and some flash cards which contain the names of some places of India to each pair of groups.
- He gave the following instructions:
 - One group of each pair will show one of the flash cards to opposite group and the opposite group will locate the place in the Atlas in a limited time.
 - Again the 2nd group of each pair will show a flash card and the other group will locate the place in the Atlas. The game will continue in this way.
 - He gave one point for each correct item and total points of each group were calculated. The winning group was congratulated.

Now reflect on the two situations and do the following activity



ACTIVITY -7

- Take any concept of mathematics of any class describe how you will teach that concept in play way method. Discuss with your tutor/ peers at the study centre for feedback and improvement.
- List the role of teacher in the use of play way method.



Compare your list with the list given below:

Role of Teachers in Play way Method:

The teachers

- Help the students to initiate games suggested by them or in developing new games with the involvement of students.
- Create a learning environment to make the children feel that learning is a joyful experience.
- Prepare relevant teaching learning materials after designing the learning activities.
- Arrange the learning activities from simple concept to complex.
- Be a guide, supervisor and a leader for the students during the learning process.
- Evaluate the students through play way activities. Evaluation should not be ignored.

Note that Montessori, Kindergarten teaching methods were developed based on the play way Method. However there are some limitations too as mentioned below.

Limitations of Play way Method:

- This method is considered to be more suitable to the pre-primary and primary level students,
- The contents and concepts of all subjects cannot be introduced through this method.
- Sometimes a few children may give more importance to playing games than learning through play way method.

Answer the following to check your progress:

E4. Which principle of play way method helps in cultivating self-discipline?

E5. Why play-way is considered more suitable for early stage of school education?

3.4.2 Project Method

Have you ever done any project work in your school? How did you do it? As a teacher do you also assign project work to your students? How do the students do that?

Do you know what a project is?



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According to John Alford Stevenson, “A project is a problematic act carried to the completion in its natural settling”. Ballard defines, “A project is a bit of real life that has been imported into the school”, while Dr. William Head Kilpatrick defines that, “A project is a whole hearted purposeful activity proceeding in a social environment”. In other words we can say that:

A project is an educational method where students working individually or in small groups analyze and develop “real-life” problem or tackle a present day theme within a preset time limit, working independently and with the division of tasks clearly defined.

From these definitions you can observe that

- A project is a task or an activity.
- It has some purpose.
- It is conducted in social and natural situation.

Characteristics of Project Method:

The project method has the following characteristics:

Problematic: Every project is intended to solve at least one problem which is perceived by the student(s). Becoming aware of the problem is the beginning of the formulation of the project.

Objective: The success of Project Method lies in the students understanding of its objectives. The objectives with which the students pursue the project are intimately associated with their real life situation and would be fulfilling some of their cherished desires.

Activity: After defining the objectives, it is your duty to create a learning environment. Students begin to learn through self planning, group discussion and group activities.

Reality: It is necessary to create real life activities for effective learning.

Liberty: In Project Method, learning takes place naturally. So, students perform activities freely.

Utility: The learned knowledge must serve the immediate needs of the students in their present life. It is necessary that the project method must be useful to the present needs.

Integration: Since a project is based on the real life problems, real experiences for carrying out the project and no real experience involves the knowledge of only one subject. One has to combine the knowledge of many subjects appropriately for successful completion of the project. Integration of subjects learnt in the classroom is the basic requirement in a project work.



Democratic values: While conducting a project, the students working in a group need to cooperate with each other, respect each other, value others opinion, assume and share responsibility. Inculcation of such characteristics leads to development of democratic values. According to Kilpatrick, this is the best method in a democracy.

Now read the following Situation.

Situation 10: *In a class the students and Mr. Santosh, their teacher, enjoyed developing and using variety of colourful teaching learning materials (TLMs). After some months they felt total disorder in storing and selecting TLMs which also slowed down their activities of preparing TLMs. Then they decided to do something and planned to install a TLM corner in the class. For this Santosh took the students to a school where TLMs were prepared and kept in TLM corners in each class. The students interacted with the students of the visited school and observed the processes of preparation, collection and the use of TLM. They were happy by this interaction and felt the need of a TLM corner in their school. After coming back, Mr.Santosh sat with the students and discussed how to go about to create a TLM corner in the classroom. During the discussion, the following questions were raised:*

- *Which place is suitable in the classroom for creating the TLM corner?*
- *What type of TLMs can be prepared for different subjects?*
- *What type of TLMs can be collected?*
- *What are the materials needed for preparation?*
- *What is the required budget for such preparation?*
- *What is the source of funds for this purpose?*
- *What is the time frame of the project?*

After a prolonged discussion, they developed a plan to their satisfaction. Then, they divided themselves into different groups, different work was assigned to each group and different materials were supplied. The students started to work.

After preparation and collection of different types of TLM like flash cards, number cards, clay models of different internal organs, different seeds, different types of soil etc., they arranged the material in a proper order in a rack placed in a corner of the room which could easily be accessed. At the end Santosh and the students sat together to evaluate their work on the basis of the following questions:

- *Are the TLMs appropriate for teaching different topics of different subjects?*



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- *Are they usable and durable?*
- *Can one TLM be used for teaching different subjects, and for teaching different concepts?*
- *Can these be handled by the students easily?*

Then the students prepared a report on the project, taking into account how they planned, the discussion held, the duties assigned and the evaluation of the project. They also wrote the use of each TLM for teaching different topics for future reference.

From the above example, you can deduce the steps of conducting a project. The steps are

1. Providing a situation
2. Selecting a problem
3. Planning the project
4. Executing
5. Evaluating

Some examples of Project:

- By visiting various public institutions the students can prepare a report on various functions of those institutions i.e. Post Office, Hospital, Bank, Police Station etc.
- They can prepare a report on the occupations of the people in their locality.
- They can prepare a report on the food habits of the people in their locality.



ACTIVITY -8

Select any one project and describe step-wise how you would organize the students to conduct it.

Advantages of Project Method

- The project method is based on the principles of active learning. The student gets totally involved in the activity which helps in enhancing his/her knowledge, understanding and skills in real life situation and ultimately in developing a holistic personality.
- Since all the activities of a project are related to the real life experiences, each of such activities is meaningful to the student. Therefore, meaningful learning is always associated with the project method.



- The student enjoys full freedom in conducting a project. This develops self-confidence to act and also promotes a sense of responsibilities among the students.
- The student gets acquainted with the types of work which he/she is expected to perform in future. Thus, the project method helps the student in his/her preparation for a future life.
- The student gets the scope to imbibe several social qualities like cooperation, and team work, group affinity, and sacrifice through project work.
- Interest and motivation for the project activities are spontaneously created and no external persuasion or force is needed to attract the students toward learning.
- Completion of the project gives individuals a sense of accomplishment which in turn encourages the student for further learning.

E6. State any three limitations of the project method.

3.4.3 Problem Solving Method

All of us face and solve a number of problems in our day-to-day life. When do you feel that a situation is problematic? How do you solve such problems?



ACTIVITY-9

List out some problems you have solved recently faced. Write down how you have solved one of those problems specifying the steps of solving it in a proper order.

Let us start from a very common problem given below:

Suppose, to reach your school on time you travel by bus. Your school is 30 km from your home. Every day you go to school by the same bus. One day, the bus breaks down on the way to your school. You are stranded. But you have to reach the school in time. What are you going to do?

What is the problem in this case? You have to reach your school on time. You are stranded and you do not know, at the moment, how to reach the school in time.

What are the ways to solve it? You may list different possible ways to reach the school in time. Possibly (i) you can walk down to the school, (ii) you can wait for the next bus, (iii) you can request a person in his



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own vehicle to give you a lift, (iv) you can hire a cycle from a nearby shop and go to the school and so on.

Which of these ways you will select? After analysing the feasibilities of each of the alternative solutions, you have to select the mode of transport so that you can reach the school in time.

Let us try to answer the question that we had raised at the beginning. When do you feel to be in a problematic situation? The answer may be like this. You are in a problematic situation, *when you know what to do? but do not know how to do it?*

In other words, we are clear about the goal or objective to achieve, but we are not sure about the way to achieve it. In the context of learning, therefore, problem solving method is all about searching for the most appropriate way to achieve a learning objective.

The children also solve many problems that they face in their day to day life in the same way as you do. They can learn by solving the problems.

Let us go through an example from a classroom situation.

Situation 11: *Mr. Saumya was teaching “Different parts of a plant” in class-VI. First he divided the whole class into small groups, gave a piece of ginger to each group and put a question to the whole class which was a problem for the students to solve.*

Q – “Which part of a plant is ginger”?

The students understood the problem as ginger being a part of a plant and they have to find the part. Some ideas about ginger came to their mind such as:

- *Its colour is brown,*
- *It grows under the soil.*
- *We take ginger as food,*
- *New ginger plants are grown from a piece of ginger etc.*

The students could have collected this information from different sources (books, by asking question to others etc.) also. From this information they might have anticipated that:



Ginger may be

- *a root*
- *a fruit*
- *a stem*

Then the students collected the information about the characteristics of root, fruit and stem and compared with that of ginger and found that ginger has the same characteristics as that of stem (presence of nodes and internodes, leaves grow from its nodes etc..). The students hence concluded that ginger is the stem of a plant and it grows under the soil. They were able to give other examples of stems which grow under the soil like onion, potatoes etc.

Steps of Problem Solving Method:

From the above situation you might have some ideas of the steps of problem solving method. However, there are many models of problem solving.. One such model for general problem solving is **the IDEAL model** of Bransford (Bransford & Stein, 1984) which is:

- 1) **Identify** the problem
- 2) **Define** the problem through thinking about it and sorting out the relevant information
- 3) **Explore** solutions through looking at alternatives, brainstorming, and checking out different points of view
- 4) **Act** on the strategies
- 5) **Look back** and evaluate the effects of your activity

Models of this type were mostly developed on the assumption that by learning abstract (not based on any content) problem solving skills, one could transfer these skills to any situation (learning any concept). This assumption does not take into account the past experiences of the student. But since 1980s researches on problem solving have inclined to be more context-based. That means the problem a student faces while studying content is always specific to a context or a situation. Therefore, the solution to that problem has to be sought within that context or situation. The nature of the problem might be different from another problem faced in another context. In 1983, Mayer defined problem solving as a multiple step process where the problem solver must find relationships between past experiences and the problem at hand and then act upon a solution.



One frequently-used model of the problem solving process is shown in figure below:

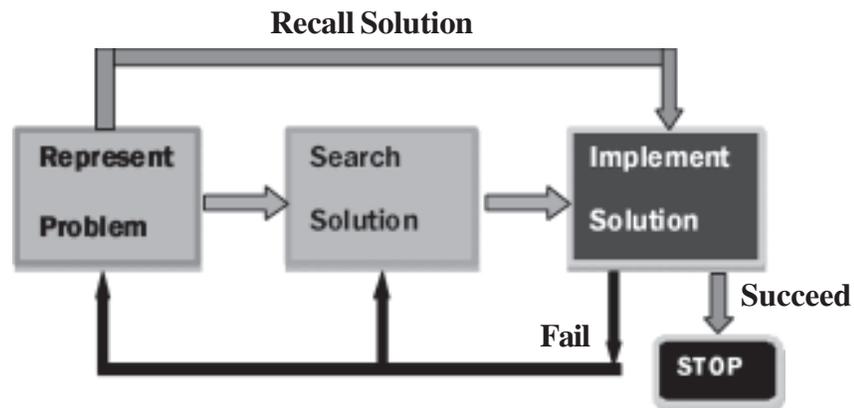


Fig.3.3: A model of the problem solving process (Source: Gick, 1986)

This model identifies a basic sequence of *three cognitive activities* in problem solving:

- *Representing the problem* includes (i) calling up the appropriate context knowledge (previous knowledge), and (ii) identifying the goal and the relevant starting conditions for the problem (Introduction).
- *Solution search* includes refining the goal (alternative solutions/hypotheses) and developing a plan of action to reach the goal.
- *Implementing the Solution* includes (i) executing the plan of action and (ii) evaluating the results.

As a classroom teacher, while following the problem solving method, you are advised to consider the following steps:

- Anticipate or identify problems.
- Use information from diverse sources to arrive at a clearer understanding of the problem and its root causes.
- Generate alternative solutions.
- Evaluate strengths and weaknesses of alternatives, including potential risks and benefits and short- and long-term consequences.
- Select an alternative that is most appropriate to goal, context, and available resources.
- Establish criteria for evaluating effectiveness of solution or decision.



ACTIVITY - 10

Select any topic from the subject you are teaching and develop a plan following the problem solving method.



Problem solving method involves reflective thinking reasoning and results from the achievement of certain abilities, skills and attitude. You should provide such situations and activities from which a problem emerges. It involves a definite procedure of confronting the problem, finding out its solution inductively and lastly testing the adequacy of the generalization by deductive approach. As this method involves reflective thinking and reasoning it is not usually used for lower classes.

3.4.4 Discovery Method

This method is otherwise known as '*Heuristic Method*'. The word Heuristic is derived from the Greek word '*Heuriska*' which means 'to find out'. It is also known as the '*Inquiry Method*'.

According to Prof. Henry Edward Armstrong who introduced this method for teaching science, "*Heuristic method is a method of teaching which involves our placing of children as far as possible in the attitude of a discoverer*". It is a method in which children discover and find things by themselves. They are placed in the position of discoverers or inventors. You need to involve your students in finding out the solutions to a problem by themselves instead of telling or lecturing them. Problems are provided to the students. The students are expected to take observations and conduct experiments as per the instructions. Conclusions are drawn by the students and hence they are introduced to reasoning skill from their own observation and experiments.

The *Stages of Discovery Method* are as follows;

1. Identification of a problem
2. Experimentation and observation
3. Problem solving
4. Evaluation

Let us observe one instance of classroom transaction following this method:

Situation 12: Ms. Minakshi was to teach the 'change in the state of matter' in Environment Studies in class IV. The objective of the lesson was: "The students learn that a solid changes into liquid and liquid changes into gaseous state when heated".

She proceeded as follows:

- *Preparations for the lesson: She collected lac, candle, sugar, rock salt, aluminium plate, water, kerosene, petrol, incense sticks, camphor, piece of wood and butter. She asked each student to select any one of the above things, and to note the name of the thing and its present state.*



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- *Identifying the Problem:* She posed the question whether the selected material would change its present state to other state or not.
- *Pupils Activity: (Experiment and Observation)* - A candle was lighted on the table to heat the selected material with the help of the necessary instrument. Every student heated the material, observed the changes and noted down the results. For example,
 - Rima heated lac in the candle flame and observed that the solid lac turned into liquid state and when withdrawn from the candle flame the liquid lac again became solid.
 - Mr. Santosh placed a few drops water on an aluminum plate and heated in the candle flame to observe that the water on the plate changed to gaseous state.
 - Ms. Rama with the lighting the incense stick observed that it turns into gaseous state directly.
- *Drawing Conclusions (Problem Solving):* Ms. Minakshi, asked each student to read out their noted results/observations and noted regarding the change in the state of different matters when heated. She drew a table on the black board/ on a drawing sheets as shown below and entered each student's observation in it.

Sl.No.	Name of the Material	State of the Material before Heating	State of the Material after Heating	Change in State

Then she asked the students to draw conclusions regarding the change of state of different kinds of material when heated by observing the entries in the table.

From the above table, students learnt that heat is necessary for a material to change its existent state to another state.

- *Evaluation:* Ms. Minakshi then wrote the names of different materials in small bits of paper. She neatly rolled the paper sheets and placed it on the table. Each student was called to select one paper placed on the table. And to read the name of the material aloud and tell the existent state of the material and its changed state when heated.

From the above situation, recognize some characteristics of the Discovery (Heuristic) method.



Characteristics of Discovery Method:

- A problem with its objective mentioned clearly is assigned to the class and each child is made to feel responsible for finding out something for himself/herself.
- Each child tries to acquire information about the problem from different sources. He/she is free to go about and discuss the problems with the classmates and teacher.
- The students can seek guidance from the teacher.
- Help is provided whenever the students feel the need. However, the teacher should try to get everything out of the students by inductive method.
- As many questions as possible should be allowed to arise from child's own observation and at times the teacher should also put questions which will stimulate the pupils to know more about a particular problem

In this way, the power of observation, experimentation, reasoning etc. are developed in the students. They learn how to gather data, interpret data, formulate tentative solution and to arrive at desired conclusions. This method can be applied where the children have to find out a cause.

E-7 State any four advantages of the Discovery method.

However you may face certain difficulties in classroom transaction using discovery method such as:

- All the students may not participate in the teaching learning situation.
- Very few of them may ask questions related to the problem given.
- Sometime the students may stop questioning.
- Sometime the students would need some reference materials.
- Sometime the students would need some apparatus / equipments to conduct an experiment.
- Sometime the students may not formulate hypotheses relating to the problem.

E8. Some statements about the Discovery Method are given below. Tick against the statements as True (T) or False (F), giving reason for your choice.

1. In discovery method emphasis is given on observation and reasoning power.
2. This method is suitable for the students of lower classes.



3. The teacher acts as co-student.
4. There is no need of homework.
5. Students learn formally in this method.
6. Learning becomes permanent.
7. The habits of self activity and self – dependence are fostered.

3.5 LET US SUM UP

- Methods are the ways of teaching. Effective learning of children depends on the method the teacher adopts.
- The methods of learning and teaching can be of two types: instructional methods and student friendly methods.
- Instructional methods are mostly teacher directed, whereas the student friendly methods are dominantly student-centric.
- Lecture, demonstration, and induction- deduction are some of the examples of instructional methods.
- Play-way, project, problem-solving, and discovery are some of the examples of student friendly methods.
- In the lecture method the teacher explains facts, information concepts laws etc. at his own pace. There is no assurance whether the students are attentive and understanding all what the teacher is saying.
- Inductive method proceeds from specific to general, concrete to abstract, whereas deductive method proceeds from general to specific, from abstract to concrete.
- In demonstration method the teacher performs an experiment or shows the chart, models etc. in the class and goes on explaining what he does.
- Children learn various concepts through playing games. Teacher has to organise the concepts in such a manner that the children learn those concepts informally by playing the game so that learning becomes permanent.
- In project method the teacher provides a situation so that the children choose a project from that situation and they plan, execute, evaluate the project themselves and lastly they prepare a report on the project.
- In problem solving method the teacher asks a question which is a problem for the students to solve. They solve the problem by collecting relevant data, formulating hypotheses, testing the hypotheses and drawing conclusion. As this method involves reflective thinking and reasoning it is useful for students of upper primary level.



- Discovery method can be applied where the students have to find out a scientific cause. The teacher assigns a problem to the students and the students find out the cause by collecting data through putting questions or by going through reference materials, then interpreting the data, formulating tentative hypotheses and arriving at conclusion.
- A concept can be taught by following different methods individually. Some concepts can be taught by the combination of different methods simultaneously.

3.6 MODEL ANSWERS TO CHECK YOUR PROGRESS

E1. When materials are insufficient for individual experimentation, experiment is hazardous to handle, experiment is time consuming.

E2.

INDUCTIVE METHOD	DEDUCTIVE METHOD
<ul style="list-style-type: none"> ● It proceeds from particular to general, from concrete to abstract. ● It takes care of the needs and interest of the children. It is a developmental process. ● It encourages discovery and stimulates thinking. 	<ul style="list-style-type: none"> ● It proceeds from general to particular, from abstract to concrete. ● The child is provided with information of facts principles and theories. ● It establishes linkage with real life observation and knowledge already gained.

You may go through the method described in the text and write down other differences.

E3. (a) D, (b) I, (c) I, (d) I, (e) D, (f) I.

E4. Principle of responsibility.

E5. Play is the natural instinct of children; play provides pleasure to young children,

- E6. (i) It is not always possible to employ it in all subject areas of the curriculum.
- (ii) It is difficult for an average teacher to plan a project and ensure the participation of all students in it.
- (iii) There is a lack of proper coordination in the experience/knowledge acquired through project method.

E7. Any four of the following:



- It develops a scientific and critical attitude in the students
- It fosters the art of testing patiently, observing keenly, and conducting experiments neatly, cleanly and responsibly.
- It develops self effort, self-confidence, self-reliance and self-determination.
- This method provides enough training to prepare them for life.
- As the students learn facts through their own labour, learning becomes more effective and permanent.

3.7 SUGGESTED READINGS AND REFERENCES

1. Modern science teaching by R.C. Sharma , Dhanpat Rai & Sons New Delhi.
2. Teaching of Science – M.S. Yadav, Anmol Publications New Delhi.
3. Teaching of mathematics –Chitragada Singh, R.P. Rohatgi, Dominant Publishers and Distributors, New Delhi.
4. In-service Teacher Education Package Vol – 1 for Primary School Teachers, NCERT.
5. Mayer, R. (1983). Thinking, Problem Solving, Cognition. W.H. Freeman and Company, New York.

3.8 UNIT- END EXERCISE

1. Name the Method:
 - a) The method in which the students find a cause by asking questions.
 - b) The method in which the students do a purposeful task in a natural environment.
 - c) The method in which one proceeds from examples to generalization.
 - d) The method in which teacher performs an experiment and explains it.
 - e) The method in which teacher explains the facts, events etc. at his own speed.
2. Write down the role of the teacher and the students both in instructional method and in student friendly method.
3. Suppose you have to teach a topic through lecture method. How will you prepare yourselves to make your teaching more interesting and effective?
4. Write down the advantages and limitations of project method.