UNIT 5 THE TEACHING AND STUDENT MODELS

Structure
5.1 Introduction
5.2 Objectives
5.3 Types of Teaching Models
  5.3.1 Advanced Organizer Model (Ausubel’s Model)
  5.3.2 Inquiry Training Model (Suchmann’s Model, 1962)
  5.3.3 Mastery Learning Model (Bloom’s Model)
5.4 Teaching Methods
  5.4.1 Discovery Learning
5.5 Programmed Learning
  5.5.1 What is Programmed Learning?
  5.5.2 Principles of Programmed Learning
  5.5.3 Types of Programming
5.6 Let Us Sum Up
5.7 Unit-end Exercises
5.8 Answers to Check Your Progress
5.9 Suggested Readings

5.1 INTRODUCTION

Teaching well means helping students learn well. Powerful learners have expanded repertories of strategies for acquiring education. Models of teaching are designed to impart those strategies which will help students to develop their personality as a whole. Models of teaching are really models of learning. As we help students acquire information, ideas, skills, values, ways of thinking and means of expressing themselves, we are also teaching them how to learn. In this unit some models are introduced with their purposes and relevance to teaching-learning. These models capitalize on our nature as social creatures to further learning and expand our ability to relate productively to one another. The simplest forms of cooperative learning organize students to help one another respond to the cognitive and social tasks presented to them through the information-processing models of teaching. The work of teaching may be planned, performed and assessed in several ways. Method can not be universal, they change in the hands of every teacher according to his/her own interest, capacity or attitude. Among many, discovery learning and programmed learning are more prominent and amendable for implementation in the computer based learning.

5.2 OBJECTIVES

After going through this unit, you should be able to:
- describe the teaching models;
- describe each model in terms of its underlying theory for real learning situations;
- describe teaching models, means and concept of discovery learning;
- meaning and concept of programmed learning;
- difference between programmed instruction and programmed learning.
5.3 TYPES OF TEACHING MODELS

The core of the process of teaching is the arrangement of environments within which the students can interact. A model of teaching is a plan or pattern that we can use to design face-to-face teaching in classroom. Each model guides us as we design instruction to help students achieve various objectives. Israel Shaffer has told three philosophical models:

- Impression Model
- Insight Model
- Rule Model

Another contribution was of John P-Pecesces, who gave the following classification:

- Basic Teaching Model
- Computer Based Teaching Model
- Teaching Model for School Learning
- Interaction Model of Teaching.

B.R. Joyce has divided all the learning models in these groups:

- Social Interaction Model
- Personal Source and Behaviours Modification Source

For inclusion in this course, we have selected only three models, which come under information processing source. We have selected these because they constitute a basic repertoire for schooling. Let's see them, one by one.

5.3.1 Advanced Organizer Model (Ausubel's Model)

Ausubel's primary concern is to help teachers organize and convey large amounts of information as meaningfully and efficiently as possible. This model is designed to strengthen student's cognitive structures, a term Ausubel uses for a person's knowledge of a particular subject matter at any given time and how well organized, clear and stable it is. This model is taken from verbal learning principle, in which the main aim is to give the most possible to students. According to Ausubel, any subject is a chain of concepts and in our mind also, when we accept these facts, that is also settled as a chain in our mind, if new concept is presented as related with the old one.

In this model, teacher first recalls the previous knowledge, then gives the new knowledge on the basis of previous one. It systemizes the subject in an order, and presents the topic in such a way that the student will grasp it easily. It is also called as expository model. Here teacher exposes the whole concepts among students. Teacher gives verbal instruction and students grasp it as a whole and a chain is made in student's mind.

It is based on the following principles:

1. **Principle of Progressive Differentiation**: In it, the most progressive idea about the subject is presented first, then are progressively differentiated in terms of detail and specifically.

2. **Principle of Integrated Reconciliation**: It simply means how the ideas should be consciously reconciled and integrated, with previous knowledge. Thus, the model is called Advance Organizer Model.

Any model could be described on the basis of following points:

- Focus or Aim
- Structure
- Social System and Support System
Aims of Ausubel's Model

- To give the knowledge of concepts and facts of subject
- To develop cognitive structure
- To enable the students to arrange the knowledge in a social order
- To present the pre-knowledge, explain facts and then present new knowledge so that the new concepts are correlated to pre-knowledge.

Structure (Syntax)

There are three phases in this model. Phase one is the presentation of the advance organizer, phase two is the presentation of the learning task and phase three is the strengthening of cognitive organization. The activities are designed to increase the clarity and stability of the new learning material. Phase and their corresponding activities have been presented in Table 5.1

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
</tr>
</thead>
</table>
| Phase-I : Presentation of advance organizer | 1. Clarify aims of the lesson  
2. Present organizer  
   Identify defining attributes  
   - Give examples  
   - Provide context  
   - Report  
3. Prompt awareness of learner’s relevant knowledge and experience. |
| Phase-II : Presenting the learning task. | 1. Present material  
2. Maintain attention  
3. Make organization explicit  
4. Make logical order of learning material explicit |
| Phase-III : Strengthening the cognitive organization. | 1. Use principles of integrative reconciliation  
2. Promote active reception learning  
3. Elicit critical approach to subject matter  
4. Clarity |

The actual organizer, however is built around the major concepts or propositions of a discipline or area of study. Following the presentation of the advance organizer in phase one, in phase two the learning material is presented in the form of lectures, discussions, films, experiments or reading.

The purpose of phase three is to anchor the new learning material in the student's existing cognitive structure that is, to strengthen it. Ideally, the initiation of phase three is shared by teachers and students. At first, however, the teacher will have to respond to the student's need for clarification. Essentially, Ausubel has provided us with a method for improving not only presentations but also student's abilities to learn from them.

Social System

In this model, the teacher is more active. Ausubel believed that only teacher can represent the systematic order of knowledge.

Teacher is enable to make effective concepts of knowledge. student's can't class-atmosphere is autocratic. Student's role is very less, they are only listeners. But in phase two and phase three, interaction of teacher and student is also done. The successful acquisition of the material will depend on the learner's desire to integrate it with his/her prior knowledge, on their critical faculties, and on the teacher's presentation and organization of the material.
Support System

Well organized material is the critical support requirement of this model. The effectiveness of the advance organizer depends on an integral and appropriate relationship between the conceptual organizer and the content. Oral and written question-answers could be used for the presentation of knowledge.

Application of Model

The model is especially useful to structure extended curriculum sequences or courses and to guide students systematically in the key ideas. Following are the main application of this model:

1. Abstract subjects which can't be seen or presented, can be easily taught by this model.
2. Cognitive aims can be achieved by this model. Selection, organization, presentation and expression can be achieved.
3. We would expect an increase, too, in the learner's grasp of factual information which could be linked to and explained by the key ideas, the concept of ideas. The concept of socialization can be drawn in the study of socialization patterns in different cultures. This advance organizer thus aids in expanding students knowledge about cultures.
4. It can also be shaped to teach the skill of effective reception learning. Critical thinking and cognitive reorganization can be explained to the learners, who receive direct instruction in orderly thinking and in the notion of knowledge hierarchies.
5. This model is considered good and used widely in school. When we present the subject in organized way, student gets all matter in systematic order. In less time, more knowledge can be given.
6. The instructional effect of this model is that the ability to learn from reading, lectures, and other media is used. Presentation is another effect, as an interest in inquiry and precise habits of thing.

5.3.2 Inquiry Training Model (Schumann’s Model, 1962)

It was developed by Richard Schumann to teach students a process for investigating and explaining unusual phenomena. His mode takes students through miniature versions of the kinds of procedures that scholars use to organize knowledge and generate principles. Based on a conception of scientific method, it attempts to teach students some of the skills and language of scholarly inquiry.

Inquiry training originated with the belief in the development of independent learners; its method requires active participation in scientific inquiry. Children are curious and eager to grow, and inquiry training capitalizes on their natural energetic explorations, giving them
specific directions so that they explore new areas more forcefully. The general goal of inquiry training is to help students develop the intellectual discipline and skills necessary to raise questions and search out answers stemming from the curiosity. Thus, Schumann is interested in helping students inquire independently, but in a disciplined way. He wants students to question why events happen as they do and to acquire and process data logically, and he wants them to develop general intellectual strategies that they can use to find out why things are as they are.

Inquiry training begins by presenting students with a puzzling event. Schumann believes that individuals faced with such a situation are naturally motivated to solve the puzzle.

Schumann believes, further, it is important to convey to students the attitude that all knowledge is tentative. Students should recognize and be comfortable with the ambiguity that genuine inquiry entails. The development of knowledge is facilitated by help and ideas from colleagues if we can learn to tolerate alternative points of view. Thus, Schumann's theory is that:

- Students inquire naturally when they are puzzled.
- They can become conscious of and learn to analyze their thinking strategies.
- New strategies can be taught directly and added to the students existing frame of references.
- Cooperative inquiry enriches thinking and helps students to learn about the tentative, emergent nature of knowledge and to appreciate alternative explanations.

<table>
<thead>
<tr>
<th>Phases</th>
<th>Activities</th>
</tr>
</thead>
</table>
| Phase-I: Confrontation with problem. | - Explain inquiry procedures.  
- Present discrepant event. |
| Phase-II: Data gathering and verification. | - Verify the nature of objects and conditions.  
- Verify the occurrence of the problem situation. |
| Phase-III: Data gathering experimentations. | - Isolate relevant Variables, Hypothesis (and test) casual relationships. |
| Phase-IV: Organization and formulating an explanation. | - Formulate rules or explanations. |
| Phase-V: Analyze inquiry strategy and develop more effectiveness. | |

Fig. 5.2: Instructional and Nurturant Effects of Inquiry Training Model
Inquiry training has five phases. The first phase is the student's confrontations with the puzzling situation. Phase two and three are the data-gathering operations, verifications and experimentation. In these two phases, students ask a series of questions to which the teacher replies yes or no, and they conduct a series of experiments on the environment of the problem situation. In the fourth phase, students organize the information they obtained during the data gathering and try to explain the discrepancy. Finally, in phase five, students analyze the problem-solving strategies they used during the inquiry. In Table 5.2, phases and corresponding activities related to the syntax of the inquiry training model has been given.

5.3.3 Mastery Learning Model (Bloom's Model)

Mastery learning is a term, formulated by John B. Carroll (1971) and Benjamin Bloom (1971). Mastery learning provides a compact and interesting way of increasing the likelihood that more students will attain a satisfactory level of performance in school subjects. They transformed their views into a system with the following characteristics:

1. Mastery of any subject is defined in terms of sets of major objectives which represent the purpose of the course or unit.

2. The substance is then divided into a larger set of relatively small learning units, each one accompanied by its own objectives, which are parts of the larger ones or thought essential to their mastery.

3. Learning material are then identified and the instructional strategy selected.

4. Each unit is accompanied by brief diagnostic tests which measure the student's developing progress (the formative evaluation) and identify the particular problem each student is having.

5. The data obtained from administering the test is used to provide supplementary instruction to the students to help them overcome their problems.

If instruction is managed in this way, Bloom believes, then time to learn can be adjusted to fit aptitude. Students of lesser aptitude can be given more time and more feedback while the progress of all is monitored with the assistance of tests.

This model is called so, because it believes in achieving mastery on a particular subject. Every class suffer from 'under-achievers' (performance of the students lacked from normal students), these students suffer from inferiority complex, which affects their progress. This inferiority complex affects self-concept. These students have low self-concept, which affects teaching. Ultimately it is an enormous wastage of expenditure on education.

Thus, Bloom presented this model to achieve mastery on a particular subject to a certain limit, to every student, called it 'Mastery Learning Model', based on two assumptions.

1. Except physically, mentally and emotionally handicapped students (ninety five percent) all students can master a certain subject, if they have given choice to learn by their own speed, and by proper teaching methods.

2. A subject can be mastered from 90 to 95%, if proper teaching methods are adopted.

Focus (Aim) of the Model

Following are the main aims of this model:

1. To develop in each pupil, a demonstrable degree of mastery over subject.

2. To provide facilities to students to develop their own skills.

3. To enable each pupil to learn at his/her own pace.

4. To develop better self-concept in students.

5. To develop self-initiating and self-directing learning in students.

Syntax

It is divided into three phases. It proceeds in the following way:
• First, all students are taught together in same way.
• Then a mastery test is given to check if students have mastered the subject.
• We separate those students, who could not master the subject, and diagnose their difficulty and divide them in various groups according to their problems.
• They are given mastery learning according to their difficulty requirements and then again they are checked by mastery test.

Table 5.3: Phases in Mastery Learning Model

<table>
<thead>
<tr>
<th>Phases</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase-I: Core Teaching Session</td>
<td>1. Informing the students about instructional objects.</td>
</tr>
<tr>
<td></td>
<td>2. Making the expected mastery level explicit to student.</td>
</tr>
<tr>
<td></td>
<td>3. Presenting the learning task to the class as a whole.</td>
</tr>
<tr>
<td></td>
<td>4. Administering mastery test and diagnosing pupil difficulty.</td>
</tr>
<tr>
<td>Phase-II: Differential Teaching Session</td>
<td>1. Clarify the pupil according to mastery level.</td>
</tr>
<tr>
<td></td>
<td>2. Provide alternative learning material to different group.</td>
</tr>
<tr>
<td></td>
<td>3. Organizing small groups instructor with teachers.</td>
</tr>
<tr>
<td></td>
<td>4. Organizing tutoring pairs with the peer group.</td>
</tr>
<tr>
<td></td>
<td>5. Diagnosing individual study.</td>
</tr>
<tr>
<td></td>
<td>6. Administering diagnosing test and pupils evaluation.</td>
</tr>
<tr>
<td>Phase-III: Intensive Teaching Session</td>
<td>1. Tutoring by the peers and the teachers.</td>
</tr>
<tr>
<td></td>
<td>2. Providing further material for practice.</td>
</tr>
<tr>
<td></td>
<td>3. Consolidation of the gains in differential teaching session.</td>
</tr>
<tr>
<td></td>
<td>4. Administering mastery test.</td>
</tr>
</tbody>
</table>

Phase one requires that the teacher present the problem situation and explain the inquiry procedures to the students (the objectives and the procedures of the Yes/No question). The formulation of a discrepant event requires some thought, although the strategy can be based on relatively simple problem — a puzzle, riddle, or magic trick — that doesn’t require much background knowledge of course, the ultimate goal is to have students, especially older students, experience the creation of new knowledge, much as scholars do. However, beginning inquiries can be based on very simple ideas.

Phase two, verification, is the process whereby students gather information about an event they see or experience. In experimentation, phase three, students introduce new elements into the situation to see if the event happen differently. Although verification and experimentation are described as separate phases of the model, the students thinking and the types of questions they generate usually alternate between these two aspects of data gathering.

In phase four, the teacher calls on the students to organize the data and to formulate an explanation. Some students have difficulty making the intellectual leap between comprehending the information they have gathered and constructing a clear explanation of it. They may give inadequate explanations, omitting essential details. Together the group can shape the explanation that fully responds to the problem situation. Finally, in phase five, the students are asked to analyze their pattern of inquiry.

They may determine the questions that were most effective, the lines of questioning that were productive and those that were not, or the type of information they needed and didn’t obtain. This phase is essential if we are to make the inquiry process, a conscious one and systematically try to improve it.

Social System

Schumann’s intention is that the social system be cooperative and rigorous. Although the inquiry training model can be quite highly structured, with the social system controlled largely by the teacher, the intellectual environment is open to all relevant ideas; teachers and students participate as equals where ideas are concerned. Moreover the teacher should encourage students to initiate inquiry as much as possible. As the student learn the principles
Design, Issues and Strategies

of inquiry, the structure can expand to include the use of resource material, dialogue with other students, experimentation, and discussion with teachers. The utilization of the inquiry training model is especially suited to the open-classroom setting, where the teachers role is that of instructional manager and monitor.

Support System

The optimal support is a set of confronting materials, a teacher who understands the intellectual processes and strategies of inquiry and resource materials bearing on the problem.

Therefore, practical exam is adopted, not written.

Application of Model

Although inquiry training was originally developed for the natural sciences, its procedures are usable in all subject areas; any topic that can be formulated as a puzzling situation is a candidate for inquiry training. In literature, murder mysteries and science fiction stories or plots make excellent puzzling situations. Following are the major applications of this model:

1. Develop scientific aptitude in students.
2. Self-confidence and self-dependency is developed by this model.
3. This model prepares the student for life, i.e. to solve the daily problems of life.
4. This model is very useful for scientific subjects.
5. Knowledge retains in the mind of student for a longer period because they learn by their own efforts.
6. It develops a critical attitude and decision power in students.
7. The instructional effects of this model are process skills, active autonomous learning, verbal expressiveness, tolerance of ambiguity, logical thinking.

Thus, it is possible for nearly all students to master any given set of objectives, if sufficient time (the opportunity to learn) is provided along with appropriate materials and instruction.

Thus viewed through these phases, they become primarily a guide to how much time a learner will need. It also suggests how to instruct, because learners of different aptitudes will learn more efficiently if the style of instruction is suited to their requirements.

Social System

In mastery learning model, teachers role is like a manager because teachers, arrange the education for students, assessing the students, classify them, solve their problems, prepare different lesson plans for different groups. Interaction of students and teacher is found in all the three phases. In all activities teachers role is highly important.

Evaluation (Support) System

Evaluation is not done for the whole class, but for every individual student, emphasis is laid on achievements and weak points of each and every student.

Criterion test is conducted. It provides a compact and interesting way of increasing the likelihood that more students will attain a satisfactory level of performance in school subjects.

Application

Bloom’s mastery learning model is aptly used in attaining mastery over a subject. Following are the main applications:

1. This model is highly useful to make mastery (ninety percent) over the subject matter.
2. There are certain concepts in a subject, which the students must know. This model is useful to master these basic concepts.
3. This model develops self-concept in the right direction.

Ryburn had aptly remarked, “To teach, we must use experience already gained as a starting point of our work.” Teaching is not a mechanical activity as it is generally understood and practised. We can't thrust some facts in the mind of an individual with any teaching device mechanically. Selection of a suitable teaching method model, a blending of a suitable model,
5.4 TEACHING METHODS

Meaning of Method

The word 'method' in Latin means 'mode' or 'way'. It means the mode by which the material is communicated from the teacher to the student. Method of teaching may be redefined as the methods by which the teacher imparts knowledge and skills while teaching and the students comprehend knowledge and acquire the skills in the process of learning. This definition clarifies that method includes both teaching (teachers activity) and learning (learners activity).

Rage defined, ‘Teaching methods are patterns of the teacher behaviours that are recurrent, applicable to various subject matters, characteristic of more than one teacher, and relevant to learning.’

It means methods are a part of the behaviour of teacher which he/she uses as a strategy or tactics of teaching. The method is also related to content and is helpful in generating learning.

History of Teaching Methods

A careful study of history of teaching methods has indicated that method of teaching has been an evolutionary process. Most of the significant changes in teaching methods have usually been associated with wider social and cultural changes. Historically speaking, J.A.Comenius was the person who laid emphasis on teaching methods.

Comenius laid emphasis on the importance of sense experience and also suggested that nature itself could provide such experiences. Comenius, in Jean Piaget’s view, “may undoubtedly be considered as one of the precursory of the genetic idea in developmental psychology”. He has further advocated that thinking was related to action as the sense impression, and out of the
interrelationship of the three came learning. Action should come prior to skill and training theory.

Pestalozzi laid emphasis on “psychologizing education”:

1. To develop methods in line with the developmental pattern of children’s growth, and
2. To make the process of perception as the central element in his teaching method.

Froebel methods laid emphasis on the study of child taking account of emotional as well as intellectual development.

Herbert devised a series of instructional steps which is known as Herbertian Teaching Method. The most popular form of 5 steps is as follows:

1. Preparation
2. Presentation
3. Association
4. Assimilation
5. Application

Similarly the supporters of Progressive Education and John Dewey have observed that the essential element in all methods is activity.

It will be relevant to say that teaching methods have been influenced over the years, by many factors, Such as:

1. Educational goals
2. Cultural and political factors
3. Study of learner's intellectual growth
4. Educational psychology
5. Analysis of learning and teaching
6. Technology

Grouping of Teaching Methods

These are numerous methods of teaching with common characteristics. These common characteristics are related to classroom interactions and also indicate the behaviour of teacher. These are also related to different modes of learning.

I.D. Zerve and N. Vaidya have tried to arrange different methods into different groups.

I. Oral Method

1. Narration
2. Recitation
3. Lecture
4. Discussion

Common Characteristics

1. Teacher-centred method
2. The teacher communicates information or gives knowledge through verbal means.

Learner is a passive listener

II. Activity Method

1. Demonstration
2. Activity
3. Project
4. Laboratory
5. Heuristic
6. Discovery learning/Inquiry approval
7. Problem-solving
8. Supervised method

Common Character
1. Learner-centered
2. Learning takes place due to active involvement of learner
3. Teacher functions as a facilitator of learning or as a stage setter for learning.

III. Special Method
1. Programmed learning
2. Team teaching
3. Computer assisted learning
4. Personalized system of instruction

These methods seek participation of learner.

Selection of suitable teaching method is based on the objective of the lesson, needs of the learner and nature of the content. Some of the commonly used teaching method are:
- Lecture Method
- Discussion Method
- Demonstration Method
- Project Method
- Inquiry Approach

These methods have already been discussed in details in courses ES-331 and ES-332. However, we shall discuss about Discovery Method in detail as it is mainly used in the computer based education programs.

5.4.1 Discovery Learning

It can be described as process of teaching and learning with the help of which learners try to find out something which was unknown to them earlier.

Discovery refers to a process of self-learning where learners generate concepts and ideas with very little teacher intervention.

Inquiry refers to stages beyond discovery where learners are systematically acquainted with scientific and logical rules used to verify those ideas.

The discovery method is used to discover new knowledge (it is at least new for the learner) through experimentation, problem solving or project work.

The BSCS Biology Teachers Handbook (1970) presents “Invitation to Inquiry”, in which student tries to do an experiment or any activity where he/she learns through active participation and systematic, continuous, work done in laboratory.

The study of science as inquiry necessitates the utilization of a variety of human resources. It is based on student’s active participation. He is engaged in laboratory work, searching new ideas in books, reading, journals, identifying problems, developing hypothesis, planning experiments, conducting experiments and gathering data. It needs creative productive thinking.

It also needs sufficient background in the subject. It requires the student to work with an open mind.

Background

Historically speaking, discovery method or inquiry approach emerged not only to minimize lecture method or memorization, but also to use the approach which is practiced by scientists.
Kuslon and Stone have mentioned that inquiry teaching is that teaching where teachers and students study scientific phenomenon with the approach and the spirit of the scientist. Since the publication of "how we think" by Dewey, problem solving approach has been accepted as an alternative to passive. In the 20th century John Dewey was the exponent of discovery learning and reflective thinking to remove the passivity of lecture method. According to Dewey, knowledge is "an outcome of inquiry and a resource in further inquiry". The recent resurgence of activity in science curriculum revision in visa has encouraged the development of those instructional processes which are inquiry or discovery based.

**What is Discovery or Inquiry?**

The art of good teaching is assisting the students to learn themselves, to discover or to find out themselves. Discovery learning demands learners active participation and require his/her own initiative to plan and conduct experiments. Engaging in discovery means (a) students try to enter in the field of work which is unknown to them (b) students project and speculate intelligently on the basis of uses, the underlying principles and generalization of the physical phenomena, (c) draw conclusions, inferences after conducting the experiment or investigation.

It is true that discovery learning has its roots in Socratic method, or 'Reflective Thinking' by John Dewey or Heuristic method or experimentation. Discovery-based activities focus on powerful classroom environments that prompt students to participate in learning. A highly motivated learner engages him/herself in meaningful learning.

Inquiry involves these processes which are known as identifying a problem, experiment, data and drawing conclusions. Schwab has correctly said that inquiry approach helps students to see science in operation. Otherwise, in traditional course students simply talk about science. Inquiry approach seeks participation of learner for solving some problems.

**Organization of Discovery or Inquiry Based Activities**

A teacher should organize students in small groups and assign roles to them in specific tasks. This will seek involvement of students in learning. Each group can be assigned task such as:
- to outline a procedure to answer the questions
- to conduct the investigation
- to collect data
- to write and report

J. Richard Srichman has advocated self-directed/inquiry where a learner directs and controls his/her own learning. Inquiry approach or discovery, the following conditions are most significant:
1. Freedom to learner
2. Providing a responsive environment
3. Guidance of teacher (if needed)
4. Encouragement to continue learning through discovery

It is the responsibility of teacher to establish those conditions which will sustain inquiry, Schwab has used two modes of inquiry. He uses the term stable inquiry which is concerned in determining the renown concepts, while the fluid inquiry invests new concepts and tests them for adequacy and feasibility. The goal of fluid inquiry is development of new principles which will re-define the subject matter and guide a new course of effective, stable inquiry.

**Advantage (Bruner)**

1. Increase intellectual potency of the learner. Individual learns and develops his/her mind by using it. Since the learner is trying to learn him/herself by using his/her mental process, he/she will grow intellectually.
2. Is based on internal motivator rather than external motivator. Learner is searching an answer to a problem, he/she is trying to discover something.

Heuristic method contains Project, Demonstration and Discussion.
1. These develop the ability to sense the relevance of variable, make intuitive leaps and cast problems into forms with which they know how to work. This they learn to organize and conduct investigation.

2. Helps in conservation of memory, aids in retention.

3. Increase achievement level of learner.

4. Instruction student-centered rather than teacher-centered

5. Minimizes verbal learning and gives time to student to assimilate and accumulate information.

Limitation

1. Teachers are not properly trained, to guide.

2. It is evident that school environment believes in achievement through verbalization, hence discovery is not encouraged.

3. Examination is recall type. Thus, a teacher prepares students for the next grade level. Consequently information is stressed and inquiry skills are de-emphasized.

4. Teacher feels difficulty in getting equipment and materials. Students need apparatus and material to explore and test ideas. Non-availability of material makes it difficult to work for most students.

5. Takes more time than recapture learning. Therefore, it is avoided. (Role of teacher in discovery or inquiry learning.)

He/She is the person to generate proper environment where students feel encouraged and motivated to learn through inquiry.

1. A science teacher should try as a motivator and facilitator.

2. She/He should provide responsive environment for inquiry learning.

3. She/He should work as a 'stage-setter' by providing required materials and facilities.

4. She/He is not simply an 'initiator' of inquiry learning but also provides continuous support to students till they become self-learners.

Richard Suchmann developed the inquiry development programme, and suggested that it:

1. Encourages students to ask questions.

2. Allows students to ask as many question as they wish.

3. Allows students to test an idea any time.

4. Encourages interaction and discussion among students.

5. Allows students to 'mess around' with materials connected with a given inquiry session, gives them the freedom to explore their ideas in laboratory, book, resource—if they desire this exploration.

Facilities for Inquiry Approach

When a teacher thinks of inquiry method, the first question which arises in his/her mind is how can I effectively organize my classroom space a laboratory and materials for inquiry learning?

A teacher can use his/her classroom by organizing small group activities. But in his/her laboratory he/she can organize project area, individual study area, and organizing small group experimentation.

In Indian condition as a teacher one has to deal with shortage of space as well as material. This short coming can be overlooked if we realize the importance of inquiry learning in comparison to verbal learning of expository learning.

Summary and Conclusions

1. Discovery or 'inquiry processes' can be described as methods of teaching and learning...
Design, Issues and Strategies

which help the students to learn themselves with minimum help from teacher.

2. It is a self-learning process.

3. Discovery approach has its roots.

4. The essential conditions for discovery learning are as follows:
   - Freedom to the learner
   - Providing a responsive environment
   - Guidance of teacher (if needed)
   - Encouragement to continue learning through discovery.

5. A teacher has to play a significant role in using discovery method, for example
   - He/She should work as a stage setter
   - He/She will act as a facilitator of learning
   - He/She should help and guide students in undertaking learning by discovery.

6. There are some advantages of learning by discovery such as:
   - Inquiry learning improves the intellectual ability of the learner
   - Encourages intrinsic motivator
   - Helps the learner to use process of science
   - A better understanding and much longer retention.

In our schools in India, generally there are certain limitations in using this method

1. Teachers are not adequately trained to use discovery method

2. Shortage of apparatus and equipment

3. Limitation of 'syllabus and examination'

4. Students are not encouraged or motivated to learn by inquiry approach.

Check Your Progress

Notes: a) Write your answers in the space given below.
   b) Compare your answers with those given at the end of the unit.
   c) What are the steps involved in problem solving method?

5.5 PROGRAMMED LEARNING

5.5.1 What is Programmed Learning?

Programmed learning is an arrangement of sequential experiences leading to proficiency in terms of stimulus-response (SR) relations.

According to Duxixoe, it is a teaching method, and Response Stimulus theory is its basis.

According to Prof. Gagne, it consists of making 'Teaching models' which take into account the initial and terminal response of the learner which are graded in accordance with a detailed schedule and permit intermediate assessment of the strategies employed.

Ake Bjerstedt (1972) has said that the term programmed learning can be used in two ways. In a narrow sense, it involves the composing of a series of tasks and their arrangement in what one believes to be an instructionally appropriate series following certain special principles. In
the broad sense programming comprises, in addition to the above, comprehensive preparatory work aimed at, among other things the analysis of goals, students, and subject matter characteristics as well as comprehensive follow up with successive testing and revision of the first version.

Programmed learning has arrived on the educational scene mainly due to the laboratory experiments of Prof. B.F. Skinner. Skinner’s theory of ‘operant conditioning’ became the basis for programmed learning technology. There are three specific elements in this process:

- a stimulus which is initially present and which becomes the occasion for a response,
- a response which is entitled rather than elicited.
- a stimulus which follows the response and which increases the probability that the response will reach in future. This is known as SR and pronounced as reinforcing stimulus.

Programmed learning has adopted this procedure of operant conditioning and today established a form of technology of teaching.

5.5.2 Principles of Programmed Learning

1. Objective specification
   You have gone through the objectives in each unit of the course materials. They are a good example of it. It means identifying the terminal behaviours that the learning will be able to perform when he had completed the program. It is described in the intended outcome rather than the substantive content.

2. Small step size
   Here the information is divided into small steps or units to do such requiring activity sanctioned by reinforces.

3. Overt responding
   It means that students or learners must act on each ‘unit of information’ by means of exercises provided to assimilate it.

4. Success of minimal error
   This means that error and failure must be avoided at all costs because they are considered as barriers or hinderance to learning.

5. Immediate feedback
   In order to ensure success and satisfaction the learners must know that the action as correct or wrong.

6. Logical and graded progress
   It implies two things – relevance of content and its graded presentation.

7. Self pacing
   Each learner moves at his or her own pace thus, allowing for individualization of instruction.

8. Empirical testing
   It is used for program development and validation.

5.5.3 Types of Programming

These are mainly of three types: linear, branching and mathematical, which are included in software. The other form is hardware, which is represented by Learner Controlled Instruction (LCI), Computer Assisted Instruction (CAI) and Teaching Machines.

Linear Programming
Here every learning follows the identical sequence, that is the frames or modules are encountered in a single, prearranged order. The proponent of this type of program is B.F. Skinner (1958).
Design, Issues and Strategies

Branching Programming

Here the particular response omitted on a frame or module determines the alternative frame/frames the learner proceeds to next. The proponent of this program type is Norman Crowder (1960).

Check Your Progress

Notes:  
a) Write your answers in the space given below
b) Compare your answers with those given at the end of the unit.
5. State main features of Linear Programme.

6. What are assumptions of Branching Programming?

5.6 LET US SUM UP

In this unit teaching methods and principles of programmed learning are discussed. Ausubel Model is primarily concerned to help you as a teacher to organize and convey large amount of information meaningfully and effectively. This model is designed to strengthen student’s cognitive structure. Inquiry training model is developed to teach a process for investigating and explaining unusual phenomena.

Teaching methods are the methods by which the teacher impart knowledge, skills while teaching, students acquire the skills in the process of learning. Discovery method, Inquiry method, and problem solving method are considered relevant in the present context.

In programmed learning the emphasis is on the learning process while in programmed instruction the users lay emphasis on the instruction process. Two types of programmed learning are discussed these are linear programming and branching programming. In linear program every learner follows the identical sequence. The learner proceeds as if a linear track or path for reaching the terminal behaviour.

In branching programming multiple choice question is asked to find out whether the student has learned. The amount of information given is much larger than that of a linear program and is followed by multiple choice answer.

5.7 UNIT-END EXERCISES

1. In your study center, have a session as a discussion forum on the topic ‘relevance of different teaching methods and use of computer in teaching’. Write a report highlighting the major issues emerged in it.

2. Go through all the teaching models. Describe the relevance of each of these models in the real classroom teaching situations. Discuss your answers with your colleagues.

5.8 ANSWERS TO CHECK YOUR PROGRESS

1. Phases of the organizer model are:
   - Presentation of advance organizer
2. Important application of inquiry training model are like:
   - To develop scientific aptitude in students
   - To develop skills to solve the daily problems of life
   - To develop critical attitude and decision power in students
   - To develop self-confidence

3. In advance organizer model teacher is more active. Teacher plays the role of presenter while students are listeners. In the inquiry training model teachers and students participate as equals. Moreover the teacher should encourage the students to initiate inquiry as much as possible. Inquiry training model is especially suitable for classroom discussions where teacher's role is that of instructional manager and monitor. In all these activities teacher's role is highly important.

4. Steps in problem solving method are:
   1. Selection of problem
   2. Statement of problem
   3. Selection of material
   4. Preparation for the solution
   5. Discussions and deliberations
   6. Statement of conclusion
   7. Evaluation

5. Features of linear programming:
   i) A linear program is composed of small steps.
   ii) The arrangement of stimulus' response is linear. Every learner follows the same path.
   iii) The programmer controls the responses of the learner.
   iv) The error of the response is reduced to minimum.
   v) The emphasis is upon the responses. The learner must respond before proceeding to next step.
   vi) The learner is prompted in the beginning of the programme etc.

6. Assumptions of branching programme are:
   - The basic learning takes place during the student's exposure to the material on each page.
   - The technique is based on the possibility of detecting and correcting errors.
   - The learner controls the exact sequence that he/she will take.
   - Through presentation of branch discrimination occurs in the power of learning almost in the natural way.

5.9 SUGGESTED READINGS

Bruche Joyce & Marsha Weil; Models of Teaching, Printice Hall of India Private Limited, New Delhi – 110 001.
