Chapter 1

Introduction
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INTRODUCTION

One of the most important challenges before education is to make learning interesting and exciting. Teaching is an activity which is designed and performed for multiple objectives in terms of changes in pupil behaviour. The learning objectives and task analysis are the foundation for effective presentation of teaching. Experts in the field of education all over the world are seriously thinking of a variety of approaches to teaching learning to achieve different instructional objectives. The main focus of teaching is to bring about a desirable change in the behaviour of learner. It is brought about by the teacher using teaching strategies. The traditional educational methods in India cannot keep pace to the changes in the people’s individual needs and aspirations and the developmental needs of the people in India. Most of these changes are affected directly or indirectly by contribution of science and technology.

Technology has helped to improve the quality and pace of activity as well as production in most aspects of human endeavour. Scientific discoveries and technological advancement have changed the pattern of life of all human beings; only the extent of change differs from one society to other or for classes of people in society. Since education involves a very large number of human beings and directs the lives of all, it cannot ignore the changes in environment.

Science and technology has a great impact on educational methods or teaching learning process. With the impact of modern technology, rapid changes are coming in the field of education. No longer a teacher is responsible to impart only instruction, he is required to engage in several professional roles, often simultaneously he is a counsellor, instructional manager, curriculum designer, academic
instructor and evaluator. All these different roles require different teaching strategies. Recent developments have made it possible for teachers to conceptualize a variety of instructional strategies, representing these strategies in concrete models of instructional intent, then collect data about their instruction to see if their instructional intentions were actually carried out in classroom. The professional competence in teaching can be increased in two ways, first by increasing the range of teaching strategies that the teacher is able to employ; second, by becoming skillful in the use of each of these strategies.

Stones E. and Morris S. (1972) defined “teaching strategy is a generalized plan for a lesson which includes structure, desired learner behaviour in terms of goals of instruction and an outline of planned tactics necessary to implement the strategy. The lesson strategy is a part of larger development scheme of the curriculum”. So curriculum and the strategy are intimately inter-linked. A teaching strategy attempt to achieve maximum in terms of desired change in learner's behaviour.

Teaching strategy can be classified under two main categories viz., autocratic strategy and permissive strategy.

- **AUTOCRATIC STRATEGIES**

  These strategies achieve different objectives than permissive strategies. Teacher remains more active and students are passive listeners. Being highly conventional style of teaching it does not consider the student's abilities, interests, and personal factors. Some of the strategies which come under this category are:
  - Lecture strategy
  - Tutorials
  - Lesson demonstration strategy
  - Programmed instruction
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Lecture Strategy: This is an oldest and most widely used strategy. It lays emphasis on presentation of fully structured knowledge to the students. In this strategy teacher is more active as compared to students. This strategy can be made more effective if teacher use question answer technique and teaching aids along with the lecture.

Tutorials: It brings into focus individual difficulties and aim to provide remedy for these difficulties. Lecture strategy can be followed by tutorials as individual difficulties can not be solved in lecture.

Lecture demonstration strategy: It is mostly used in professional schools and training colleges. It consists of three successive steps:

a) Introduction: Here aims are stated.

b) Development: This step involves a good deal of activities and questionnaires.

c) Integration: In this step the lesson material is rehearsed, revised and calculated.

It is less autocratic than lecture strategy. It can be used as a supplementary technique in stimulated social training.

Programmed Instruction: By its careful control of stimuli and response, programmed instruction has revolutioned the process of teaching and learning. B.F. Skinner (1954) presented first and most common type of programme known as linear programme. On the basis of his experiments skinner presented a research paper, “The science of learning and the art of teaching”.

Crowder (1959) introduced branching program. In the same line Gilbert (1963) came out with concept of Mathetics programming. All these are based on principles of small steps, active responding, immediate confirmation, self pacing and student’s testing.
• **PERMISSIVE STRATEGIES**

In these strategies both student-teacher interaction is maximum and both remain active in teaching process. These strategies encourage creativity of the pupils and include some of the following types

- Heuristics
- Question answer strategy
- Project strategy
- Assignment strategy
- Debate
- Brain storming
- Computer Assisted Instruction

**Heuristics:** The term ‘Heuristic’ has been derived from latin word ‘Heurses’ meaning ‘discover or investigate’. This strategy was originated by Prof. H.E. Armstrong. It aims at discovering things by the learner instead of telling by teacher. All the methods like Inducto-deductive method, analytic – synthetic method, laboratory method comes under or can take the form of heuristic strategy.

**Question Answer Strategy:** It was developed by famous philosopher Socrates. He assumes that all knowledge with in the learner and teacher has to unfold and that teacher should present the subject matter in such a way that learner recognizes the truth and he / she can identify himself / herself with it. Though it is difficult to prepare good questions and arrange them in psychological sequence still it can be supplemented by lecture or other strategies.

**Project Strategy:** In this strategy emphasis is laid on relating education to life situations. In nutshell it is an experience centered teaching strategy.

**Assignment Strategy:** This strategy provides the situation for the assimilation of the content.
Debate: In this two or more learners having contradictory opinion on an issue present formal speeches in favour of their position and thus have the opportunity to get the views held by the opposite party.

Brain Storming: it is completely permissive style of teaching strategy. It is a problem oriented strategy where students learn in a group.

Computer Assisted Instruction: In this kind of strategy teacher is replaced by computer and was first employed by Stolurow and Davis in 1965. The computer selects the suitable instruction on the basis of learner’s entry behaviour.

Strategy is a part of teaching apart from many more activities involved in this process and the blue print of teaching which takes into consideration all those activities which are needed to generate educational environment within the framework of task in hand and reference to the essential elements of teaching.

Joyce and Weil (1984) writes “Teaching models are just instructional designs. They describe the process of specifying and producing particular environment situations which cause the student to interact in his behaviour”. In simple words models are representation that summarise and thus act as an aid to comprehension.

Models of teaching try to describe teaching as it ought to be. Psychologists are of the view that the best substitute for the theory of teaching is a model of teaching for it explains the various teaching and learning conditions and their relationship. When we teach well, we help students learn well. A model of teaching helps learning. Powerful learners have repertoires of powerful strategies for acquiring education.

1.1. FUNDAMENTAL ELEMENTS OF MODEL OF TEACHING

A model of teaching generally consist of five fundamentals elements.
1. **Focus**

   This term refers to the goal or objectives of teaching. It involves a description of the aspects of the students and the learning environment.

2. **Syntax**

   The syntax of the model involves the description of structure of activity (Description of model in action) we describe syntax in terms of the sequence of the activities, which activity should be taken first and which will follow.

3. **Principles of reaction**

   It helps the teacher to select the reaction he will make as he interacts with the student. In some models the teacher overtly tries to shape behaviour by rewarding certain activities of student and maintaining a neutral stance towards others. In other models the teacher tries not to manipulate rewards but maintains carefully equal status with students in helping them to select their own means of judging and guiding their activities. In short principles of reaction provide teacher with rules of thumb with which he can gauge the student and select his responses to what student does.

4. **Social System**

   There are three sub concepts which we use to describe the social systems viz., a description of the kind of student teacher role, norms that are encouraged and student behaviour which is rewarded, and a description of hierarchial relationship. The social system of a model can be more structured or less structured. The structure of a model can be varied. We can tighten or loosen the structure considerably.

5. **Support System**

   The support system is required so as to create the environment specified by the model. Support system has two sources namely, the role specification for a teacher and the sub-stantive demands of the
experience. It refers to additional requirement beyond the usual human skills and capacities.

6. Evaluation System

It assesses the extent to which teaching has been successful. It describes the strategies of evaluation, time of evaluation and purpose of evaluation. Models can be divided into four categories.

i) Social inter-action models- These models emphasise the relationship of the person to his society or his direct relationship with people.

ii) The information processing model – In these models emphasis is on the ways and means a learner handle stimuli from the environment, organizes data, senses problems, generate concepts and solutions to the problems and employ verbal and non-verbal symbols.

iii) The personal models - These models lay stress on personal development as a source of educational ideas.

iv) Behaviour modification Models – They emphasise on sequence of learning activities and shaping behaviour by manipulating re-inforcement.

1.2 COMPUTER BASED TEACHING MODEL

The computer is one of the most important and outstanding invention that has made an increasing and powerful impact on teaching learning process. In past, computers were used in India mainly for storage and processing of data. If we can put the information handling power of the computer at the disposal of teacher and pupil we open up the possibility of revolution in education.

Computer allow a large variety of contents and symbolic modes ranging from printed words to dynamic scheme, from graph to musical notation, while all other instructional technologies are restricted to a
particular kind of symbol systems (words, picture, number, space, tone etc.) and hence to a limited range of contents. Computers differ from other technologies in a variety and kind of activity that they afford ranging from responses to questions as in drill and practice programmes to autonomous hypothesis testing in simulation, from discovery like activities via game playing to rigorous logical planning in programming and from writing and revising to calculating and categorizing. No other technology known to us allow such a wide variety of contents, symbol models and learning activities.

The critics see the computer as an agent of destruction of human qualities. They claim that no computer can ever match the spontaneity, the versatility and the emotional caring of human teacher. It is important to notice that no one is talking of excluding the teacher from classroom. The teacher is being simply released from some of the chores of information processing just as he was previously released from some of the chores of information transmission by a wide spread use of books. It is notable that those who are developing computer techniques for the classroom speak not of “computer managed education” but of “computer aided instruction” (CAI). The over all control of computer assisted instruction remains with the teacher.

Computer based model is the most complex teaching model of the personal or psychological model. Lawrence Stolurow and Daniel Davis (1965) developed this model. The teacher is replaced by computer in making decision and providing actual instruction. Teaching process is divided into two phases by Stolurow and Davis viz. (i) The pre-tutorial phase – This phase has single purpose i.e. to select for a particular student or a group of students having similar pre-requisites, a teaching programme that will achieve specific instructional objectives, (ii) The tutorial phase – This phase has two purposes; firstly to put the programme which has been selected to use and secondly to observe the
student’s performance to discover whether a new programme may be more suitable than original one.

As this model of teaching is highly individualized, different types of students can study different types of programmes on the same topic at the same time, but the problem arises when no programme is located. In such cases computer rejects the students or requires changes in instructional objectives.

CLASSROOM APPLICATION

Computer based model can be implemented on any subject along a continuum of various degrees of automation. Automation assist the teacher in carrying out and managing the process. So based on automation computer model has three main applications.

1.2.1 Computer Assisted Learning - In Computer Assisted Learning the programmes are designed to encourage knowledge by finding out, and learning, rather than by drill and practice. The material is so presented that a student learns by investigation. In this application often simulation is used.

1.2.2 Computer Managed Instruction - Here the computer can serve as classroom terminal assisting the teacher in diagnosing and prescribing a course of instruction for the students. The actual instruction may be self-instructional packages or more convenient instruction. The computer programme is designed not only to supervise a test but also, to direct each student as an individual to the next appropriate set of tasks. Each student's record is also retained by the computer so that the teacher can find out at any time an individual students progress.

1.2.3 Computer Assisted Instruction - Here the computer is used by the student as a means of instruction. CAI can be applied to display lesson material, re-inforce learning, simulate
environmental conditions, provide drill and practice and administer tests and so on. Essentially the computer programme issues a piece of information and then raises a question about it. The learner supplies an answer if this response is correct, the programme moves on to the next step. If it is not so, that is if response is incorrect, then the information is presented again and retested. Computer managed instruction and computer assisted instruction carry out educational functions inclusively.

1.2.4 Computer Simulated Instruction – Simulation is the act/process of pretending an assumption or imitation of a particular appearance or form.

Simulations are condensed learning exercise, specially designed to represent vital real life activities by providing learners with the essence of essential elements of the real life situation without its hazards, costs or time constraint. They are realistic imitations.

Simulations provide learning situations to challenge a students’ thinking skills. Instructional simulation is used to teach students how things work. Computer simulation use computer as a simulator to create real life situations. By creating a model of how something works or behave students can, change the variables of the program to see how the subject might act. They are particularly useful in situations where the first hand experience is too expensive, risky, unavailable or inappropriate.

It may fall into any of the following three categories:

- task performance simulations
- system modelling simulations
- encounter simulations
• **TASK PERFORMANCE SIMULATION**

In this type of simulation, realism is must to ensure that end-user learning will transfer to the activity concerned. It may require a good and costly infrastructure in order to make it a real look. Such a simulation helps its end-users to acquire skills related to the specified task. For example, Driving Simulator, Traffic Simulator, Flight Simulator etc. fall in this category which would require a special arrangement of accessories to be attached with computer.

• **SYSTEMS MODELLING SIMULATION**

These type of simulations are aimed at providing its learners with a meaningful understanding of the systems under experimentation. Actually, the world may be described as a vast net work of varying kinds of systems such as Economic System, Weather System, Political System, Air Traffic system and so on. Such simulations must contain information and data required to explain the state of a system as well as rules required to govern the activity. Users can use the system modelling simulation for understanding the concepts related to the system and later on can experience its behaviour under the changed parameters, following which user can gain a lot about the system as well as its behaviour.

• **ENCOUNTER SIMULATIONS**

These types of simulations are different from system simulation as the experience may not be formalized and structured enough to be represented in a system. For example, job interviewing encounters provide the candidate with hypothetical problems and opportunities that require some decision or action. Candidates may learn and gain about such situations after observing the consequences of their actions. Such type of simulations encourage its users for indulging in the activities and experiences which otherwise are very difficult to attain.
Simulation increases motivation, interest and self confidence and can accommodate students of different ages and levels of maturity. Computer simulations bring approximate reality far more closely than take considerable time and demands expected too much from the teacher.

Computer Simulation can do wonders in the fields of science. One of the areas of high potential is obviously the laboratory where through simulations students can do experiments normally considered impractical or impossible to conduct otherwise (Barnato and Barret 1981). Mosiehopour, Saeid, Iowa (1993) found that computer simulation enhances the student knowledge of the subject matter.

Education simulation like all other well organized learning experiences must be carefully designed with specified objectives.

1.3 COGNITIVE STYLE

The term cognition concerns the way human being perceive and learn, how they reason and think, even how they remember and imagine and how their “minds” work in ordinary day-to-day activities of life.

Each individual has preferred ways of organizing all that he sees; remembers and thinks about. Consistent individual differences in these ways of organizing and processing informations and experiences have come to be called as ‘cognitive style’. These styles represent consistencies in the manner or form of cognition or the level of skill displayed in the cognitive performance. Cognitive styles are conceptualized as stable attitudes, preferences or habitual strategies determining a person’s typical modes of perceiving, receiving, remembering, thinking and problem solving (Hilgard and Bower, 1986) Cognitive style may entail generalized habits of information processing, to be sure, but they develop in congenial way around underlying personality trends.
Cognitive style describes different ways in which people process information including perception, thinking, reasoning, understanding, problem solving, transformation and utilization of information from the environment.

Goods (1959) defined the term cognitive as concerned with the process of gaining information and understanding of the world through personal experience.

Sigel and Coop (1974) viewed learning style as integral concept that bridges the personality cognitive dimensions of individuals'.

Gibson (1976) defined learning style as “the different ways in which people process information” in the course of learning.

Laycock (1978) described learning style as “an individual’s characteristic way of responding to certain variables in the instructional environment.

Shuell (1981) stressed that cognitive style refers to “Preferred ways that different individuals have for processing and organizing information and for responding to environmental stimuli”.

Agarwal (1987) defined cognitive style as “Sum total of individual’s preferences for physical, social, emotional and environmental elements in the course of learning. Since these elements may vary in degree for different students and in different situations, there may be various type of learning styles for different students. Thus cognitive styles are intimately interwoven with affective temperamental and motivational structures as part of the total personality.

Agarwal (1983), analysed the available literature on learning styles and identified eight learning styles as relevant and important from the point of view of (i) teaching learning process, (ii) Indian context, (iii) his definition of learning style. These are:

1. Individualistic vs. Non-Individualistic
2. Field Independent vs. Field Dependent

3. Motivation centred vs. Non-motivation centred

4. Aural vs. Visual

5. Environment oriented vs. Environment free

6. Flexible vs. Non-flexible

7. Short attention span vs. long attention span

8. Responsible vs. Irresponsible

1.3.1 Field Independent Vs. Field Dependent

Students who do not prefer to work in structured learning situation have been classified as having field independent learning style. On the other hand, who enjoy working in structured learning situation are classified as having field dependent learning style.

Teaching learning process involves a simultaneous mutual exchange of ideas and interaction between the teacher and his students where besides the teacher the learner has to organize himself for work. To do the assigned work, to solve problems and to make decisions which reveal something about his unique style of learning. There are major differences in learning style from one student to another and these differences can have a significant bearing on classroom learning. Researchers have concluded that learning style of students affect greatly the quality of student’s achievement.

Student’s needs, requirements, abilities, capabilities, their ways of learning etc. have been neglected for a long time and they were forced to learn same thing by the same method, by the same person in the same environment. Not only it is important that teachers recognize these diversities in their students but also it is desirable that they value these styles. Otherwise, even if appropriate strategies are developed and made available to teachers, there may be little demonstrable gain in pupils.
Study of cognitive style is an attempt to understand individual differences in these processes which might account for the wide variation in outcome among children and adults ostensibly faced with the same task.

1.4 INTELLIGENCE

As compared to animals human being is considered to be blessed with certain cognitive abilities which make him a rational being. All human beings are not all alike. There are some who are more intelligent than others. The term intelligent has been defined and studied by different psychologists and researchers.

Terman, L.M. (1921) ‘An individual is intelligent in proportion as he is able to carry an abstract thinking’.

Wagon, M.J. (1937) defined intelligence as ‘the capacity to learn and adjust to relatively new and changing conditions’.

Webster Dictionary (1958) maintains that intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment.

According to Encyclopedia Britannica (1926) intelligence is described as the general ability of the organism acting as a whole:--to utilize understanding gained in the past experience in dealing with a similar or new situation; to adjust or adapt quickly and readily to the environment; to learn without difficulty; or to form new behaviour patterns to meet a new situation by the modification or readjustment of those already acquired.

Freeman (1962) gave the three definitions of intelligence:

- Intelligence is the adaptation or adjustment of the individual to his environment.
- Intelligence is the ability to learn
- Intelligence is the ability to carry out abstract thinking.
Woodworth (1972) has defined intelligence as intellect put to use.

Good (1973) regards intelligence as the ability to learn and to criticize what is learnt, the ability to deal effectively with tasks involving abstractions, the ability to learn from experience and to deal with new situations and a degree of ability represented by performance on the group tests selected.

Piaget (1960) described intelligence as the ability to modify and expand cognitive structures through the process of accommodation and assimilation.

Guilford (1967) provided a complete factorial picture of the intelligence. In this theoretical 'structure of the intellect' he suggested that the mind is composed of three dimensions, namely contents (the terms in which we think), products (the ideas we come up with) and operations (the act of thinking). He argued that five factors in the operation domain (cognitive, memory, divergent thinking, convergent thinking and evaluation) operating on four factors in the content domain (figural, symbolic, semantic and behavioural) resulting into six factors belonging to produce (units, classes, relations, systems, transformations and implications) give rise to one hundred twenty mental factors that are responsible for some one being intelligent.

So intelligence can be considered in terms of ability of an individual to adjust to learn and carry abstract thinking. Psychologists have devised many tests for the measurement of intelligence on the basis of which intelligence of an individual is measured. From administrative point of view measurement of intelligence can be classified into two broad categories namely: a) individual tests-in which only one individual is tested at a time. b) Group tests – In which group of individuals are tested.

Another way of classifying the intelligence test is based on the form of test.
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i) Verbal Test:- These tests make use of language. Here the instructions are given in words (either in written or oral form or both) Use of language and paper pencil are required.

Under group verbal intelligence come tests like Army Alpha Test; the group test of general mental ability constructed by Dr. J.S. Jalota, Prayag Mehta’s Group Intelligence Test, Raven Progressive Matrices Tests.

As intelligence is not a thing, it is only an idea, an abstraction, therefore when we measure intelligence with the help of an intelligence test we try to interpret the resulting score in the light of norms established (Group performance) by the author of the test. In this way one’s intelligence is determined.

ii) Non-verbal Tests or Performance Tests:- In such tests there is no use of words either by the examiner in giving the test or by the subjects in responding to it. Here the subject responds by overt action (such as fitting pegs into a peg board or tracing a maze). Broadly such test is intended to measure actual accomplishment rather than potential ability or aptitude regardless of how the subject is instructed to respond.

Several tests that yield separate scores for verbal and quantitative abilities are related to the group intelligence tests but are more specifically designed to assess school learned abilities and to predict academic success.

Voluminous research in the field of education and psychology has led us to the belief that intellectual superiority of an individual is the most important determinant in the field of academic performance. Intelligence paves way for brilliance in academics. The concept of intelligence has been defined in various ways.
Binet (1905) holds that the essential characteristic of intelligence is the ability to judge well, to compare well and to reason well, viz. the adaptation or adjustment and the ability to carry an abstract thinking.

Thorndike (1913) defined intelligence as ‘the power to make good responses from the point of view of truth or fact’.

Intelligence is considered as most important correlate of achievement so intelligence is the common factor to affect the achievement of learner.

Vernon (1969) summarized the concept of intelligence as basically involving (a) Genetic capacity—that intelligence is part of genetic equipments (b) observed behaviour – that intelligence results from both hereditary and environment factors and (c) a test score that intelligence is the construct measured by an intelligence test.