Department of Open & Distance Learning

Punjabi University, Patiala

Class : M.A. II (Education) **Semester : 4**
Paper : I (ICT in Education) **Unit : II**
Medium : English

Lesson No.

2.1 : Programmed Learning : Meaning, Concept, Purpose, Characteristics

2.2 : Styles of Programming : Linear Programming, Branching Programming and Mathetics Programming

2.3 : Introduction to Computers : Input and Output Devices, CPU system uses of computers, internet and e-mail in teaching and learning

2.4 : Use of EDUSAT and multimedia programmes in school situation, pedagogies using ICT in classroom Academic and research content on the web

M.A. (EDUCATION)PART–II **Paper -I**

(ICT IN EDUCATION)

LESSON NO.2.1 **AUTHOR: DR. N. S. MAVI**

PROGRAMMED LEARNING

Structure of the Lesson

2.1.1 Introduction

Before we discuss the meaning of programmed learning, let me tell you the objectives of this particular lesson. These are the objectives that you are supposed to have achieved if you have once mastered this lesson. These are the objectives that you are supposed to have achieved if your have once mastered this lesson.

2.1.2 Objectives of the Lesson:

After having gone through this lesson you should be able to :

(1) Write the meaning of programmed learning in you own works:
(2) List the five basic principles of programmed learning.
(3) Differentiate between mandatory and option al principles of programming:
(4) Specify the characteristics of programmed learning materials:
(5) Distinguish between programmed materials and conventional textual presentation.

2.1.3 Meaning of Programmed Learning :

Programmed learning represents a systematic, empirical attempt to convent the craft of teaching into a prospective theory and practice of instruction. As such, it may rightly claim to have pioneered the route that points forward to a full-fledged technology of education. Since this movement has become world-wide, it has attracted the attention of all those concerned with the teaching learning activities. So at the outset, it would be most appropriate to scan the definitions of programmed learning as proposed by experts on programming.

The most commonly help view of programmed instruction, is still, one derived from Skinner's work. This view, as stated by Leith (1957); is a programme is a sequence or small steps of instructional material Called frames), most of which requires a response to be made by completing a blank space in a sentence. To ensure that expected responses are given, a system of cueing is applied, and each response is verified by the provision of immediate knowledge of results. Such a sequence is intended to be worked at the learner's own pace as individual self-instruction.

Jacobs, Maier and Stolurow (1966) expressed that self-instructional programmes are educational materials from which the students learn. These programmes can be used with many types of students and subject matters, either, by themselves (hence the name "self-instruction") or in combination with other instructional programmes is called self-instruction. Students can master the material without the aid of a live-instructor; so sometimes programmed instruction is also known as auto-instruction. All self-instructional programmes have certain features in common. First, these require the student to focus his attention on a limited amount of material at one time. Second, these require him to response in some way to each segment of material. Third, these give him immediate knowledge of result after every response. These three features, in sequence, constitute what is called learning cycle, which is repeated many times in a programme. Fourth, these permit each student work at his own pace. Programmes may be presented on paper for reading, on tapes and records for listening, or on television and films for watching. All these features listed by Jacobs etc. at are to be found in programmes. Idea of programmed instruction, as conceived by Susan Markle (1969), is as follows : "It is a method of designing a reproducible sequence of instructional events to produce a measurable and consistent effect on the behaviour of each and every acceptable student."

Unlike Markle, another expert on programming, Green (1962), wrote the following long statement while summarising his own conception about programming : "A programme consists of a series of stimuli designed to exert increasing control over gradually developing behaviour repertory. Reinforcement derived from matching behaviour to the stimulus requirements accomplishes the differentiation procedure. The frames of the programme are discriminative stimuli anticipating probable courses of action on the part of the student and directing his

action by limiting the range of alternatives available to him. They are instructions in the broadest sense. Violating the limits result in non- reinforcement, Remaining within the bounds result in reinforcement. The bounds narrow progressively to define the ultimate form of the new reparatory. As they have been developed, programmes make use of continuous reinforcement, both in the development of discrimination with regard to the material to be taught and in the differentiation of the response class to be shaped. In this respect programmes embody the means for rapid training. There are also possibilities for applying other techniques of control to produce more permanent learning."

The super mentioned idea about the concept of programming, as explained by expert programmers may be summarised in one paragraph as follows:

Programmed instruction is a technique of converting the live instructional process into self-learning or auto-instructional readable material in the form of micro-sequences (the segments of subject-matter) - which the learners are required to read, make some right or wrong response, correct wrong responses, or confirm the right response and attain complete mastery of the concept explained in the micro-sequences, which form a complex subject matter of some wider instructional sequence for a Unit of Instruction.

Thus, following the Skinnerian principles of ‘operant conditioning’ learners are able to attain perfect mastery of the complex subject-matter comprising some instructional units which have been rendered auto-instructional in the form of frames by the expert programmer.

2.1.4 Evolution of the Concept of Programmed Learning

Programmed instruction is the outcome of research conducted by some experimental psychologists, like Thorndike, Waston, Pavlov, and Skinner, technically labelled as behaviourist’. These psychologists were interested in understanding the process of learning and at the same time understanding and improving or shaping the behaviour of organisms, birds, animals and humans on the basis of their experimental findings. The first psychologist, whose findings bear direct relevance to programmed learning, is Thorndike (1874-1949). He is well known for his laws of learning. His famous “Law of Effect” states that learning, which is accompanied by satisfaction on the part of the learner, is likely to be more effective and permanent than learning which is accompanied by dissatisfaction or annoyance. Successful actions are more likely to be repeated than those which bring discomfort or annoyance. The reward received by the learner act as a reinforces of his behaviour. Thus anything which has the effect of strengthening successful behaviour (response) is known as reinforcer. Programmed learning is related with the findings of Thorndike as the instructional technology does use the device called teaching machine which presents finely graded series of problems and provides immediate reinforcement for the learner's correct response.

The psychologist, like Watson and Pavlov, contributed indirectly to the movement of programmed instructional technology in a sense that they accorded psychology the status of science and thus made human behaviour, especially the process of learning, accessible to scientific investigation, Green (1962) has rightly said "Our objective is the analysis of the learning process in order that we may employ more effective technique of education. The techniques we effectively employ, the questions we as of nature, the behaviour of students in a class-room, are continuous with the technique and physical nature of all scientific endeavour. There is a difference in complexity between the behaviour of the laboratory animal and that of the student solving a problem in differential equations. There is no essential difference between two organisms in the process by which their behaviour are established." Thus, Waston (1913) had rightly said, "Psychology, as the behaviourist views it, is purely objective experimental branch of natural science its theoretical goals is the prediction and control of behaviour". So experimental psychology sowed the seeds of "Behaviourism" which has a direct bearing on the movement of programmed learning and instruction technology. Hence, the credit goes to Watson for discarding all the make believes psychology and putting it within the ambit of objective sciences.

Sydney L. Pressey (1927) is often credited with the widespread use of teaching device in the class-room. Pressey primarily was interested in automatic testing device, but he soon discovered that student could also learn by taking tests via his machine. Pressey and his followers have published a number of papers in which various designs of machines have been described and evaluated. Basically, the type of programming developed by Pressey followed the format of multiple choice items. The student was presented with a question and four options; only one of which was correct. He choose an option and the device provided an immediate feedback. If the learner choose the correct answer, the machine presented the next item; if an incorrect option was chosen by him, he continued responding till be selected the correct option. Pressey discovered that machine not saved a vast amount of marking but also produced measurable increased in learning. He developed several models of recording devices.

In this way Pressey paved the way for the development of instructional programmes which could be fed into the teaching device. Also the need for empirically developed programmes was felt when the markets in State started sell-empirically developed programmes was felt when the markets in State started selling teaching machines along with other educational aids like films, tape- recorders and overhead projectors. Thus origin of the technique of Programmed Learning, as essentially new, may be thought to have emerged from dynamic efforts of American

Psychologists during the second decade of present century.

By 1954, B. F. Skinner and his associates deviced the auto-instructional methods which have served the present generation Instructional technologist as the basis for the recent advances in programmed learning. On the basis of his extensive, research on rats and pigeon Skinner formulated a theory of learning, technically termed as 'Operant Conditioning'. In operant conditioning, response of the organism is more voluntary and spontaneous and the probability of the recurrence of the spontaneously omitted response is increased if it is reinforced after its occurrence. Skinner demonstrated that pigeons can be taught to preform surprising feats provided they are trained in very small stops taken one at a time and provided that each successful step is reinforced or rewarded.

If pigeons can be taught this way', said Skinner, 'so can be children'. The technique is to organise and arrange the complex subject matter into very small pieces of information or sequences that can be learned step by step, and to reinforce success at each step not by presenting corn grain but by immediately telling the learner that his response is correct. By means of this technique the learner is led in a series of small and easy steps ("successively closer approximation") from an initial level of learned verbal behaviour to the level of verbal behaviour desired. In Skinnerian terms, the learner's verbal behaviour is "shaped" through programmed instructional material. Thus, by harnessing the principles of operant conditioning in teaching the human beings, Skinner developed some programmes and also evolved a teaching machine which circumsented the limitations of Pressey's model. He evolved a sound auto-instructional model which is popularly known as Skinnerian or Linear model of programming.

Programmed instruction today has evolved to such a fine extent that it forms the throbing heart of modern instructional technology. Starting from experimental psychology and experimental studies pertaining to the learning process by behaviourists, we have been led into a new Era of course, promising and exciting Era of Instruction

Technology. In order to have a clear idea about programmed learning materials, please read the following steps (frames) one after another. Every frame has one blank space, fill in this blank space, then compare your answer by looking at the correct answer given below the frame within the bracket.

2.1.5 A Segment of Linear Programme

(From the book "Elements of Physical Geography; Geomorphology – A Programmed Text Approach" by Dr. N.S. Mavi).

1. The hard and resistant materials forming earth's crust are generally termed as rocks. Granite and standtones are hard and resistant so they may be termed as.....

(rocks)

2. Marble is also very hard and resistant, so it may also be termed : as a.....

(rock)

3. Sand and clay are not hard and resistent, but are soft and loose, these are also termed as rocks. Thus, scientifically speaking, theterm rock applies to any materials of the earth regardless of their hardness or.....

(softness)

4. Chalk, salt and soil are soft and loose, like sand and clay, and they may also be termed as.....

(rocks)

5. Rock implies any type of ..... comprising earth's crust.

(materials)

6. On the basis of their colour, origin other properties the ..... are broadly) classified into three major groups. (rocks)

7. Igneous, sedimental and metamorphic are the broad ..... classes of rocks. (three)

8. The three types of rocks differ from each other in terms of their mode or origin, colour, texture and other properties. On the basis of their varied properties, rocks are classified into types. (three)

9. The word igneous is from a Latin word 'ignis' (which means' fire). Thus the.....rocks are fire-f formed rocks.

(Igneous)

10. Rocks formed from sediments accumulate-or long periods (usually under water) aretermedas..... rocks.

(sedimentary)

11. Sedimentary rocks are composed of.....and occur in layers or strata. Since sedimentary rocks occur in layers of strata they are also called stratifiedrocks.

(Sediments)

12. Stratified rocks is anothernamefor .....rocks.

13. All rocks, whether igneous or sedimentary may become metamorphosed (changed) under intense heat and/or pressure conditions. Such changed rocks aretermedas.....rocks.

(metamorphic)

14. When igneous or sedimentary rocks become metamorphosed, their original character and appearance is greatly altered by heat and pressure, particularly during intense earth movements. Now they become .....rocks.

15. Rocks are mainly of three types; namely; (metamorphic)

(i) igneous rocks;

(ii) sedimentary rocks;

(iii) ……rocks. (metamorphic)

16. Rocks containing high proportion of silica are said to be acidic igneous. Granite has high proportion of silica, so granite is an .....rock. (acidic igneous)

17. Acidic igneous rocks are denser and lighter in colour. Granite rock is lighter in colour and denser. It is a igneous rock.

(acidic)

18. Igneous rocks containing high proportion of basic oxides are known as Basic .....rocks.

(igneous)

19. Iron contains high proportion of basic oxides, so iron will be known as .....igneous rock.

(basic)

20. Like iron, aluminium and magnesium are also basic igneous rocks and they (contain/do not contain) high proportion of basic oxides.

(contain)

21. Basic rocks are denser and darker in colour, whereas acidic rocks are denser but .....in colour.

(lighter)

22. Acidic rocks contain high proportions of silica, whereas basic rocks contain high proportions of basic.....

(oxides)

23. On the basis of their origin, igneous rocks are of two types, namely ..... and extrusive.

(Intrusive)

24. Intrusive rocks are formed at some depth in the earth's crust, thus these rocks are not found at the.....surface of the earth's crust.

(Outer)

25. When the magma solidifies after cooling below the surface of the earth, it leads to the formation of large, easily recognizable crystals. Granite is a crystal line rock; so it is a (n)..... rock

(Intrusive)

26. Diorite and gabbro are also rocks of similar origin as granite. Hence, these are also rocks.

(Instrusive)

27. When the solidification of magma occurs at moderate depths below the earth's surface. Dolerite rocks are formed, So dolerite rock is a (n).....rocks which is usually blank in colour.

(Intrusive)

28. When the solidification of magma occurs at great depths in earth's interior, the intrusive rocks are termed as plutonic rocks. So plutonic rocks are nothing but ..... Rocks occurring at great depths below the earth's surface.

(Intrusive)

29. When solidification of magma occurs at greater depths in earth's interior, the intrusive rocks are termed as plutonic rocks. So plutonic rocks are nothing but.....rocks occurring at great depths below the earth's surface.

(Intrusive)

30. Formation of course grained granite occurs at greater depth; therefore, granite is a typical example.....rocks. Its colour is usually red, pink or white.

(Intrusive)

31. Rocks occurring well below the earth's surface in large deep seated instructions are termed as.....

(Intrusive)

2.1.6 Principles of programmed Learning

The programmed material given above has been prepared, keeping in the following five basic principles :

1. **Principle of small steps :** The basic idea of programmed learning is that the most efficient, pleasant and permanent learning takes place when the student proceeds through a course by a large number of small, easy-to-take steps. Hence, a programme is made up of large number of small steps through which the student proceeds from knowing very little about a subject to its complete master. So the first principle of programmed learning is the principle of small steps. According to the principle the subject matter is arranged into meaningful segments of information called "frames" to which learner responds one by one.

2. **Principle of active responding :** Another finding from the psychological laboratory is that the student learns best if he is actively responding as he is learning. The learner remains busy and active when he works on a programme. A good programme requires a thorough understanding of the previous frame before one moves to the next frame. Active responding on the part of the learner means involvement in the learning process. It does not mean a small response to a small bit of information. The material of the programme

is so structured that the learner is called upon to make a series of responses to series of frames either by writing an answer or performing a physical task or merely speaking the response to himself. In some programmes, he cannot move ahead until he has correctly responded to the previous frame.

3. **Principle of immediate reinforcement :** A third principle from psychological laboratory is that a student learns best when he can confirm his response to a frame immediately. A student who must wait weeks together for test results will not learn as well as student

whose test is scored and made known immediately. Through the programme the learner receives immediate confirmation of the correctness of his response before he proceeds to the next step. This reinforces the learning process. Necessity of providing immediate confirmation is important from two angles; first, in any systematically developed programme, the learner will not wildly guess the responses second, when learner is unsure of his response, he needs its confirmation. So in programming student can find out immediately if his answer is correct or incorrect as the principle of immediate confirmation is being used.

4. **Principle of self-pacing :** Programmed learning takes into consideration the psychology of individual differences and provide freedom to the learner to make fast or slow progress according to his pace of learning. Each learner proceeds with the programme at his own speed. This rate progress is determined by the speed at which he works. The learner is not required to wait for those who are slower than him. When each student can spend as much as little time as he wishes on each step or he can work each step as quickly as he chooses, the principle of self-pacing is being employed.

5. **Principle of student testing :** The fifth basic principle of programmed learning is the principle of student testing. In the programme the detailed record which the student leaves in the form of responses provides the basis for revising the programme. Students miss steps because these are too big, unclear, or have not been reviewed often enough. By looking over a programme one can see exactly what steps came before a particular step on which the learner falters. Since accurate records of the learning experiences of each student are available, revisions can be made on the basis of actual student

responses. By revising the programme on the basis of the records, programmes can be developed which teach more efficiently and effectively. Thus, the record left by student in a programme serves as a powerful tool for learning about learning. It has been a characteristic of science that great strides forward are made when powerful new observing instruments are developed. So it is felt that the step by step record of learning provided by the programme may prove to be an equally powerful tool in studying the most complex scientific phenomenon of human learning.

2.1.7 Mandatory and Optional Principles of Programmed learning

Edward F O 'Day (1971), in his book "Programmed instructions Techniques and Trends", has tried to differentiate between mandatory and optional principles of programming. According to him, the mandatory principles are those which are critical and essential for distinguishing programmed materials from other forms of instructions such as conventional class-room instruction, text-book based instruction etc. The optional principles are those which may not be present in programmed materials. The following three principles have been identified as mandatory principles :

(i) The principle of objective specification.

(ii) The principle of empirical testing ; and

(iii) The principle of self-pacing.

A programmed learning unit is evolved by specifying the objectives of instruction in behaviour terms. The developed materials have to be empirically tested for their effectiveness. It must be ensured that the learner proceeds at his own pace.

The optional principles of programming are:

(i) The principle of overt responding.

(ii) The principle of immediate feedback ; and

(iii) The principle of small step size.

Current research has revealed that these principles are neither essential nor desirable for certain types of contents. Covert responding has proved to be more effective then overt responding; delayed feedback has ensured better retention than immediate feedback, large step size has faciliated better learning than small step size in some of the learning situations. Since these research findings are not conclusive, these three principles have rightly been labelled as optional principles.

2.1.8 Characteristics of Programmed Learning Materials :

A genuine programmed learning material can be distinguished from other type of learning materials on the following attribute.

1. **Guaranted Comprehensibility :** The programmed learning material no only promote effective learning but also ensure cent-percent understanding of the subject-matter.

2. **Tested Efficiency :** The fact that the programme will teach effectively and efficiently is based upon tests conducted on the intended group of learners.
3. **"Skip Proof" Feature :** The programmed material is so designed that the learner has to go through each and every frame in order to attain the terminal goal. He cannot afford to skip over some chunks of frames in order to complete the entire learning sequence.
4. **"Self Correcting" Feature :** The learner is able to get immediate knowledge of result when he reads a particular programme frame. If he responds correctly he get confirmation; if responds incorrectly, he get corrected by checking his response with correct response supplied by the programming.
5. **Automatic Encouragement :** When the learner responds correctly, he gets reinforcement. Thus, the learner gets automatic encouragement, white he is working on programmed learning material.
6. **Diagnostic Feature :** The programme helps the teacher to diagnose the learners difficulties on particular programme frames and on specific criterion test items. Thus, remedial instruction can be provided by the teacher via construction of more simpler frames on

   the difficult concept encountered by the learners while reading the programme, of through the organisation of remedial teaching sessions for ensuring mastery learning.

2.1.9 Summary :

In this lesson we have studied in detail the concept, evolution, basic principles, mandatory and optional principles of programmed learning and chief characteristic of programmed learning texts.

2.1.10 Suggested Questions :

1. Explain the meaning, evolution and basic principle of programmed learning.
2. Differentiate between the mandatory and optional principles of Programming. How does a programmed text differ from an ordinary text book?

2.1.11 Suggested Readings

1. Richmond, W. Kenneth : The concept of Educational Technology, Weidenfield and Nicolson, London,1970.
2. Smith W.I. &Moore. J. W. : *Programmed Learning*, D Van Nostrand company Inc. New York, 1962.
3. Espich, J .E. &Williams, B. : Developing Programmed Instructional

Materials, Fearon Publishers, Inc., California,1967.

4. Leith, G.O.M. : A Handbook of Programmed Learning, University of Bermingham;1967.
5. Jacobs, P.I., Mainer, et, al, A Guide to Evaluating self Instructional Programmes; Holt, Rinehart &Winston,1966.
6. Markle, S.M. : Good Frames and: A Grammar of Frame Writing John Wiley and sons, Inc. New York,1969.
7. Mavi, N.S. : Programmed Learning - An Empirical Approach, Vishal Publications, K. U. Kurukshetra,1984.
8. Green E. J. : The Learning Process and Programmed Instruction, Holt, Rinchart and Winston, Inc., New York,1962.
9. Thorndike, E. L. : Human Learning Appletoe-Century-Crofts,1981.
10. Watson, J.B. : Psycho logy from the standpoint of a Behaviouri st. Philadelphia, Lippincott,1919.
11. Skinner, B.F. : The Science of Learning and the Art of Teaching, Harvard Educational Review, Vol. 24, No.2,1954.
12. Pandey, K. P. : A First Course in Instructional Technology. Amitash Parkashan, Ghaziabad,1980.
13. Pipe, Peter: Practical Programming, Holt, Sinehart &Winston,1965.
14. O' Day, Edward F. : Programmed Instruction. Techniques and Trends, Appleton Century Corft, Educational Division, Meredith Corporation, New York,1971.
15. Lumsdaine, A.A. :Glaser, R. (Eds): Teaching Machines and Programmed Learning: A Source Book, DAVI, Washington, D C, 1960.
16. Rowntree, Derek. : Basically Branching-A Hand Book for Programmers, McGraw Hill Book Com, New York,1963.
17. Taber, J I. Et. AI : Learning and Programmed Instruction.
18. Callender, Patricia, : Programmed Learning; Its Development and Structure, Longmans, Green &Co., London.1969.
19. Unwin, D. And Leedham J (Ed): Aspects of Educational Technology, Metuen &Co. 1, 78,1968.
20. Bjerstedt, AKE. Education Technology, Wiley Intersdence, N. Y.1972.

LESSON NO. 2.2 **AUTHOR: DR. N. S. MAVI**

STYLES OF PROGRAMMING

Structure of Lesson

2.2.1 Objectives :

After having gone through this lesson you should be able to :

(1) List the three styles of programming:

(2) Explain the meaning, underlying rationale, basic strature, merits and limitations of linear programming:

(3) Explain the meaning, underlying, rationale, basic structure, uses and limitations of branching programme:

(4) Explain the meaning, underlying, rationale, basic structure, uses and limitations of mathetics programme:

(5) Point out the similarities and differences among the linear, branching and mathetic style programme.

2.2.2 STYLES OF PROGRAMMING

Various styles of programming have emerged since the year 1954. It is very difficult to have broad classification of the various styles of programming. Looking into the programmes developed in U.S.A., U.K., India and some other countries, we find a very wide flexibility shown in the choice of styles. Programmers have experimented with these styles and have tried to assess the learning potentially of each of these. Programmed material can be presented to the learner either in book form through teaching machine or a computer in the following popular styles:

1. Linear or Extrinsic model of programming.
2. Branching or Intrinsic model of programming;
3. Mathetics

2.2.3 Linear or Extrinsic Model of Programming

1. Meaning

A linear, or a Skinnerian programme is a single-path sequence in which all students read and respond to the same material. It is a programme in which each student works on every frame in the same order, no matter how adequate or in

adequate his response is. It presents a sequentially arranged material. This how the first programme style to appear on the educational scene. It was enunciated and popularized by B.F. Skinner (1954) on the basis of his theory of learning called 'Operant Conditioning'. This programming style is also known as 'Operant Conditioning Model'. No one in auto instructional field has applied the theoretical constructs to the design of devices and programmes as persistently and as confidently as have Skinner and those who share his views. The operant conditioning principles and techniques that appear to work to successfully in training animals areas sumed' to apply to human learning as well.

2. Basic Assumptions of Linear Programme

Basic Assumption a linear programme, according to Lysaught and Williams (1963), are :

(i) Each stimulus should be designed to elicit the correct response by the student and that his own construction he response is an integral part of the learning situation.

(ii) Response made overtly, by constructing them in writing, more effectively assure the occurrence of learning.

(iii) Presentation of the material in small steps, a wide range of examples and conditions, minimizes errors and it is a very important requirement for learning to take place.

Susan M. Markle (1979) mentions the following three basic principles of linear programme which indicate its assumptions :

(a) **Active responding:** The student learns actively what the programmer leads him to do. An active response is not necessarily a small one nor is it necessarily an overtone.

(b) **Minimum errors :** By good design of the instruction and by repeated try-out and revision of the instruction, errors made by students in responding to frames and in exhibiting the final behaviour are held to a minimum. An error is a response that the programme did not expect or does not wish the learner to make.

(c) **Knowledge of results :** In some fashion, a student should be given such feedback on the adequacy of his response. This may be provided by skilful design, which leads a student to be right and be sure or is right, or by providing an answer as a guide to checking himself if he is unsure or in error.

3. The Underlying Rationale of Linear Programme

David Cram gives the rationale of the linear programme as enunciated by B.F. Skinner as follows:

(i) **The Short Step** is characteristic of all linear programmes for two reasons:

(a) If the act of responding tends to cause learning, each step must be short enough so that the student is very likely to answer correctly;

(b) Too many mistakes are discouraging, whereas correct answers are, reinforcing to the students.

(ii) **B. F. Skinner's** linear programme requires a constructed response for two reasons:

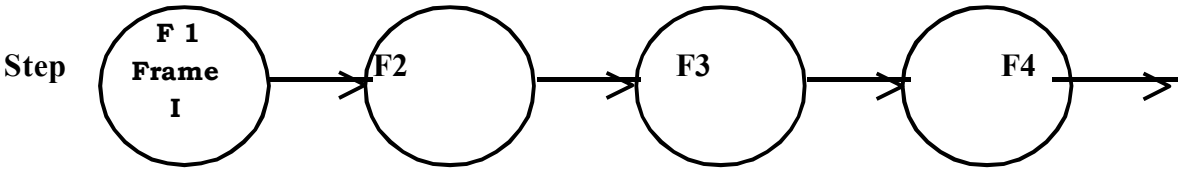
(a) RECALL is more efficient learning process than RECOGNITION;

(b) The act of RESPONDING tends to cause LEARNING, therefore, the student should not be exposed to incorrect alternatives.

Some more varieties of linear style programmes are now in vogue which are primarily based upon Skinner's Reinforcement Theory of Learning technically called as Theory of Operant Conditioning'. ,

4. Basic Structure

In a linear programme, the learner proceeds as if on a linear track or path for reaching the terminal behaviour. He takes up the information on behaviour of the first frame, then to the second, and likewise to the third and the fourth one till he completes the entire unit of the programme. The sequence through which he processes the variety of information is in the form of a straight line. The word linear has been attached to this model of programme mainly a use of this reason. Diagrammatically, the steps of a linear programme can be represented as follows



An example illustrating linear programme has already been given in the lesson. A linear programme is also known as an extrinsic programme as the instructional sequence is extrinsically controlled by the programmer. All the learners proceed through the same frames and in the same order as desired by the programmer. The matter is so arranged that the learner makes only correct responses throughout the programme and receives in consequence only positive reinforcement. If a student responds incorrectly to a particular frame, he may have to repeat the frame, or he may be told what the correct response is. In any case, he is not allowed to go to the next frame until he responds correctly to the frame in hand.

There are three essential components of a linear programme :

(i) The terminal behaviour – the desired outcome of the programme sated in behavioural terms;

(ii) The programme module – a number of frames through which the learning material is presented.

(iii) The criterion test – a test to measure the desired learning outcome.

5. Limitations of Linear Programme

The linear style of programming has the following limitations :

(i) It curbs the freedom and flexibility of approach in learning. It takes the learner on a regimented path in a rather monotonous manner;

(ii) The contents which require critical understanding and discussions cannot be subjected to the rigours of a linear programme. For designing the learning sequence for teaching of higher order concepts, this procedure is considered to be inappropriate;

(iii) It does not permit variety in the style of presenting the information and content;

(iv) It assumes that step by step presentation of material with a provision for committing minimal errors process of learning. This tends to under-estimate the role of errors in the promotes learning. Through experience we come to know that we very often learn by committing mistakes.

(v) Expert programmes are not easily available especially, in India. So we have a dearth of excellent linear programmes in various subjects.

2.2.4 Branching Programme

1. **Meaning :** The branching, or Crowderian, programme is composed of several paths or branches. The paths, or learning sequences, that a particular students takes are determined by his pattern of responses. Student who make errors are exposed to more material than those who respond correctly. In a Branching Programme the learner has a wider choice of selecting his own learning sequence and it is not extrinsically provided for as in case of a linear programme. This style was first invented by Pressey for use with his original teaching machine in 1926. In 1954 the method was further developed by Norman. A Crowder who was training American airmen to trace breakdown in electronic equipment. It is also called intrinsic because the learner himself makes the decision to adapt the instruction to his needs. In his words, branching or intrinsic programme is one which adapts to the needs the students without the medium of any extrinsic device as a computer.

2. **Basic Assumptions of Branching Programme :-** The basic

assumptions underlying a branching programme are as follows:

(i) Basic learning takes place during the student's exposure to the material on each page;

(ii) The technique is based on the possibility of detecting and correcting errors because it is thought impracticable to attempt to eliminate error;

(iii) The learner controls by the adequacy of his grasp of the material, the exact sequence he will take from among the available tracks in the programme;

(iv) Through presentation of a branch, discrimination occurs in the process of learning almost in a natural way.

3. **The Underlying Rationale of Branching Programme :-** The rationale of Branching or intrinsic programming postulates that the basic learning takes place during the student's exposure to the new material on each page on the pattern of tutor-learner instructional process. It is not based on any sound psychological theory of learning, rather it is based on the theory of teaching termed as "Tutorial Instruction". The basic intrinsic or branching programming technique amounts to nothing more than the inclusion of multiple-choice questions in relatively conventional expository text and the use of these questions to continually check the students' progress through the material and to furnish specific remedial material as it is required. In branching programmes, the questions serve primarily the diagnostic purpose, and the basis of the technique is the fact that the diagnosis so made can be promptly utilized to furnish specific remedial to the student.

4. An Example of a Branching Programme

Page I

Solar system consists of the sun, the nine planets, thousands of small planets, several flashing comets, satellites and meteroids. The sun is the centre around which all these heavenly bodies revolve including our earth which is one of the nine major planets.

Q. The centre of the solar system is

A. Earth ..... se page10

B. Sun..... se page5

C. Moon..... se page12

WAP Page10

Your answer is earth. Sorry, a very bad guess. Our earth is just one of the nine major planets revolving round the sun.
Please go to page I again and select the correct alternative.

WAP Page 12

Oooff! You are wrong. Please go to Page 1
and try to select the correct answer.

HP

Your answer is sun. Very good ! You are right !
Now you read the further exposition on the topic given in the following paragraph:

A family of celestial bodies revolving round the sun is termed as 'solar system'. The sun, which forms the centre of the solar system, is a vast, hot, gaseous mass emitting enormous tongues of crimson deep purplish) flames which reach as sunlight on our planet, earth. The outer temperature of the sun is as high as 6,000°C. The temperature at the centre of the sun is even more than, 1,000,000°C which we as human beings cannot imagine.

Q. Sun's rays reach the earth to provide us light, because:

A. Sun is very hot..... se page13

B. Sun is made up of gases ..... se page16

C. Sun emits huge amount of crimson flames.....se page 20.

Diagram: Format of a Branching Programme:

INFORMATION

Q.....(Major stem of M.C.O.)

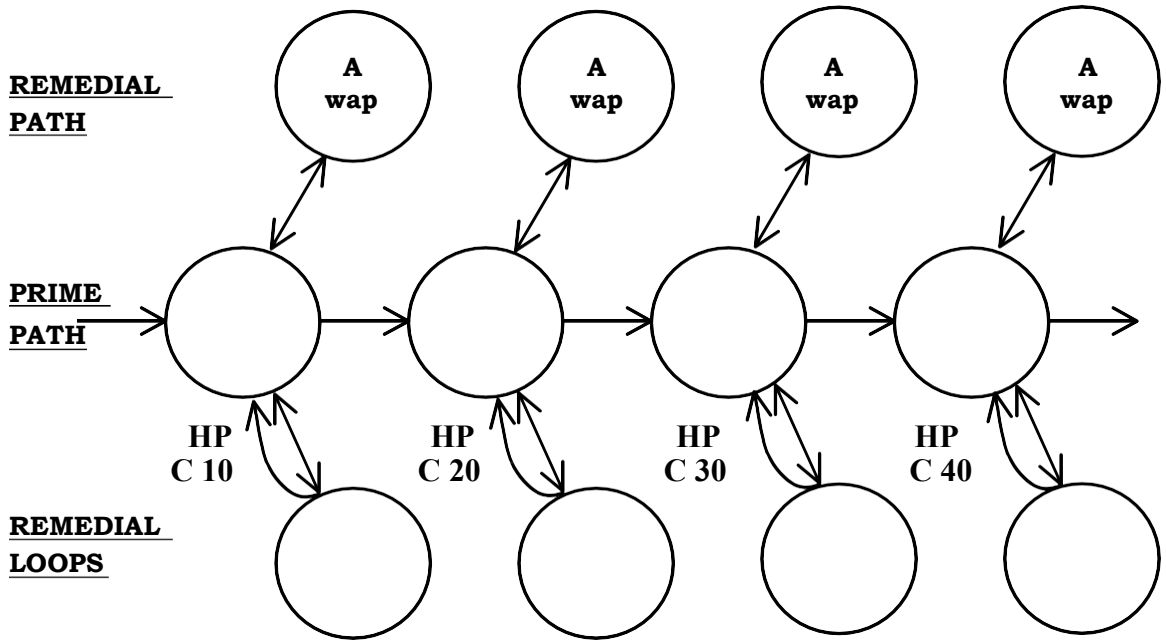
A. .....
distracters.
B. .....
C. .....

Alternative including correct answers and plausible

5. **Basic Structure of Branching Programme :** The branching programme is usually presented in a book format or through a computer. When it is presented in a text book format, it is called a "scrambled" book. There are two types of pages in a branching programme. One type of the pages is called home page (HP), which leads the student to additional facts and information. A home page of a branching programme. One type of the pages is called home page (HP), which leads the student to additional facts and information. A home page of a branching programme contains information followed by a multiple-choice type question which has one correct alternative and usually two incorrect alternatives. If the learner selects correct alternative, he is directed to go to a correct answer page which may give him further information on the topic. If the learner selects any of the incorrect alternatives, he is directed to consult remedial path page so as to get remedial instruction and arrive at, ultimately, the correct response. The other type of the pages is called wrong answer page (WAP) where the student

gets auto elucidation and further explanation about the nature of the error committed by him in response to question given on HP. This helps him to find out the reason for his mistake, if any. In the Home Pages are given the materials to be learned in small logical units. Immediately after a student has read the digested one of these units, i.e. is given a short test in the form of a multiple choice type of question; the responses to the test item are used to determine what next unit of information shall be presented to the student. For instance, the student's response to a test item might indicate that he has understood then is sent to the next home page (HP), to get further facts and information. On the other hand, his test response may indicate that he does not understand the information he has just studied or may show that he has understood the lesson material only partially. in this case he would be directed through the medium of the programme (remedial sequences or WAP's) to the next appropriate bit of information to restate the lesson, or to clarify a point that he has misunderstood, or to return to the previous unit of material and work through it again.

To make the concept more clear, the module followed in this style of programming is shown below diagrammatically:



B	**B**	**B**	**B**
wap	**wap**	**wap**	**wap**

At the end of frame ONE there are choices, A, B and C. If the learner selects either a or B, he is directed to read the frame again as they constitute wrong answer pages (WAP's). If the choice falls on C, he is advanced to the SECOND frame and gets additional information or material. These frames in the programme i.e, 10, 20, 30, 40 etc, are the home pages (HP's). The learning sequences presented in HP's (home pages) are called as PRIME PATH. Textual material is presented through WAP's (wrong answer pages) are termed as REMEDIAL LOOPS Remedial loops help the learner in detecting and correcting his errors. In this way the learner is able to attain the mastery of the subject.

6. **Limitations of Branching Programme :** Although a branching programme is referred to as an intrinsic programme, it is doubted whether there is a genuine choice of learning sequence in accordance with the need of the learner.

Major Limitations of a branching programme are as follows:-

(i) Designing of alternatives to a response is sometimes difficult to manage for various types of content. In such cases, a branching programme becomes a handicap.

(ii) Since use of prompts is restricted, it is not always possible to arrange the branching sequences which explain the subject matter-without creating confusion and ambiguity in the process of learning.

The process of feedback is subtle and hence it is not possible to forestall the point where the learner is not making proper progress.

(iii) In the subject-matter where logical gradation is already present, branching sequence presents a real difficult.

(iv) The learner may guess the correct response without understanding the subject matter of the frame. Moreover, it is very difficult to ask questions pertaining to the whole subject matter of the programme.

(v) Infinite branching is not feasible; so we cannot cater to the needs of

all individuals.

(vi) Finally, cost of preparation is very high as the programme needs frequent revisions.

2.2.5 Mathetics Programme

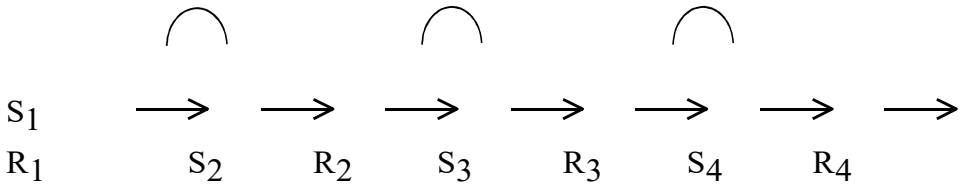
1. **The Concept of Mathetics Programme :-** Mathetics is defined as a systematic application of reinforcement theory to analysis and construction of complex repertoires which represent the mastery of subject-matter. The technique of programming is very suitable for developing programmes pertaining to the acquisition of psychomotor, computational and other such like skills. This system is quite different from the two basic styles of programming. It was developed by Thomas F. Gilbert in1962.

2. **Basic Assumptions :-** Behaviour is generally classified as involving discrimination, generalization and chaining and the strategy of instructional sequence is varied which is necessary to teach for these three behavioural classes. The unit for mathetical sequence is called an exercise in order to distinguish it from the usual frame in programmed instruction.

Retrogressive chaining or otherwise 'Backward Chaining' represents the aspect of the mathetics approach that differentiates it from the other programming styles.

(i) **Principle of Chaining :-** The chain of stimulus and response is helpful in developing the mastery of content and determining its structure. The elements of content are presented in stimulus and response form. The chain is formed by arranging stimuli and responses when a response works as stimulus for next stimulus.

Diagrammatically it can be shows as :



(ii) **Principle of Discrimination :-** The Discrimination situation of learning is generated by providing different stimuli which have different responses.

Every stimulus and response is independent to each other.

S_1 —R_1

S_2 —R_2

S_3 —R_3

S_4 —R_4

Every stimulus has its own response.

(iii) **Principle of Generalization :-** The generalization is a critical situation of learning. It helps in achieving higher cognitive objectives of learning. In this type of situation a group of stimuliemits single response.

S_1 |

|

S_2 |R

|

S_3 |

|

It is known as the process of generalization. It is opposite to discrimination.

3. **The Underlying Rationale of Mathetics Programme :-** The rationals of mathetics is that the closer the student is to reinforcement when he is tought, the more effective that reinforcement becomes. The reinforcement, in this case, is the completion of the task. Gulbert dealt with three types of behaviour : discriminations, generalizations and chains. Primary emphasis was given to identifying the total range of stimuli which control the various responses of 'operants' and to describing sequence of operants which constitute chains.

4. An Example of a Mathetics Programme:

Exercise 1. To find square of any two digit number ending in.

A. Multiply the first digit number by the next higher consecutive digit.

B. Write 1 to the right of result.

(No response required)

Exercise 2. To find the square of 31

A. Multiply the first digit number (3) by the next higher consecutive Digit (32) Result 96 96

B. Write 1 to the right of Result96 961

C. The square of 31 is961

(No response required)

Exercise 3. To find the square of 41 .

A. Multiply the first digit number (4) bythe next higher consecutive digit (42) 168

B. Write 1 to the right of result 1681

C. The square of 41is

Ans. 1681

Exercise 4. To find the square of 81

A. Multiply the first digit number: (8) by the next higher cons ecutive digit (82)

B. Write .....to the.....of result.

C. The square of 81 is .....

Ans. A. 82 ×8 = 656

B. Write I to the right of656 = 6561

C. The square of 81is = 6561

Exercise 5. To find the square of 91

A. Multiply.....by.....

B. Write..... To the..... of.....

C. The square of 91is

Ans A. Multiply 9by22 =828

B. Write 1 to the rightof828 =8281

D. The square of 91 is8281

Exercise6. Find out the squares of 51, 61, 71, 11,21

Ans. 2601, 3721, 5041, 121, 441

5. Structure of Mathetics or Basic Steps in Designing Mathetical Programme

The basic steps in designing a mathetics programme, using "Retrogressive Chaning Technique", are usually three which are as follows:

Demonstrate : Here the entire procedure is demonstrated to the student. The programmer supplies the student with all the steps upto the mastery steps. The mastery behaviour is shown in the beginning itself.

Prompt : Here the programmer supplies the student with all the steps leading upto the mastery step and prompts him to perform the mastery step.

Release : Here the programmer provides all the steps, leading upto the step immediately proceeding the last sub-mastery step (preceding the mastery step), prompts the step and releases the student to practise the mastery step. The programmer continues in this manner, each time allowing the student to perform one addition step until he has worked back of the first time step in the procedure and can perform the entire task.

This is basic concept of "Retrogressive Chaining", demonstrate prompt and release. Graphically illustrated, a sequence involving four sub-mastery steps and mastery step will take the diagram that follows:-

SMS		**SMS**	**SMS**	**SMS**	**SMS**	
Exercise	1	D	D	D	D	D
	2	D	D	D	D	P
	3	D	D	D	P	R
	4	D	P	D	R	R
	5	D	P	R	R	R
	6	P	R	R	R	R
	7	R	R	R	R	R

D = stands for demonstrated step P =

stands for prompted step

R = stands for released step MS

= stands for mastery step

SMS = stands for sub-mastery step

This sequence is followed in respect of each mastery behaviour that the programmer is intending to develop through mathetical exercises. The size of frame a each stage-demonstration, prompting and release varies in accordance with the ambit of behaviour rather than information.

6. Limitations of Mathetics

(i) Starting with end behaviour sometimes overwhelms the learners rather than becoming challenging for some students, especially the slow learners, who might otherwise turn out to be excellent performes.

(ii) Secondly, only concrete material and subject matter involving psychomotor skills can be gainfully programmed by means of mathetical model. Not all behaviours are amenable to the retrogressive chaining sequence.

(iii) There is a lot of technical flavour in this approach. This discourages the practical minded people to try it.

(iv) The analysis of behaviour in term of three stages-demonstrate, prompt and release presents a real difficulty to the beginners in programming.

2.2.6 SUMMARY

We had a detailed discussion pertaining to the three popular styles of programming, Namely : linear, branching and mathetics, The linear programme was enunciated by B F. Skinner. The style is also called as extrinsic or Skinnerian style. It is based on the principles of 'Operant conditioning' theory put forth by Skinner. Detailed systematic information, new terminology or previously completely unknown topics, factual material, scientific rules, concepts and principles, make good materials for linear programmes Linear style consists of introductory, teaching and criterian frames and a criterion test which is applied to

assess learning outcomes.

Branching style, also known as intrinsic or Crowderian style, was enunciated by Norman A. Crowder. Branching programmes are most suited for teaching concepts, discrimination s descriptive subject matter involving discussion and critical analysis. It consists of Hps called prime path and, WAPs called remedial loops. A home page of a branching programme contains information followed by a multiple choice type of question which has one correct alternative and two or more incorrect alternatives.

Mathetics style was enunciated by T.F. Gilbert (1962). It is highly suitable for learning which requires physical activity. It is helpful in mastering tasks involving psychomotor skills. We discussed the meaning, basic assumptions, underlying rationale, basic structure and limitations of linear branching and mathetics style programmes.

2.2.7 Suggested Questions

1. Discuss the basic assumptions, underlying rationale and basic structure of a linear programme. Illustrate with examples.
2. In what way does Crowder's Branching programme differ from Skinner's linear programme? Under what learning conditions branching is more efficient? Discuss.
3. Discuss the meaning underlying rationale, basic structure (with illustrative frames), merits and limitations of Mathetics Style Programme.
4. What is retrogressive chaining in the context of mathetics? Describe with illustration.

2.2.8 Suggested Readings

1. Richmond, W. Kenneth : The concept of Educational Technology, Weidenfield and Nicolson, London,1970.
2. Smith W.I. &Moore. J. W. : *Programmed Learning*, D Van Nostrand company Inc. New York,1962.
3. Espich, J .E. &Williams, B. : Developing Programmed Instructional Materials, Fearon Publishers, Inc., California,1967.
4. Leith, G.O.M. : A Handbook of Programmed Learning, University of Bermingham;1967.

5. Jacobs, P.I., Mainer, et, al, A Guide to Evaluating self Instructional Programmes; Holt, Rinehart &Winston,1966.
6. Markle, S.M. : Good Frames and: A Grammar of Frame Writing John Wiley and sons, Inc. New York,1969.
7. Mavi, N.S. : Programmed Learning - An Empirical Approach, Vishal Publications, K. U. Kurukshetra,1984.
8. Green E. J. : The Learning Process and Programmed Instruction, Holt, Rinchart and Winston, Inc., New York,1962.
9. Thorndike, E. L. : Human Learning Appletoe-Century-Crofts,1981.
10. Watson, J.B. : Psycho logy from the standpoint of a Behaviourist. Philadelphia, Lippincott, 1919.
11. Skinner, B.F. : The Science of Learning and the Art of Teaching, Harvard Educational Review, Vol. 24, No.2,1954.
12. Pandey, K. P. : A First Course in Instructional Technology. Amitash Parkashan, Ghaziabad,1980.
13. Pipe, Peter: Practical Programming, Holt, Sinehart &Winston,1965.
14. O' Day, Edward F. : Programmed Instruction. Techniques and Trends, Appleton Century Corft, Educational Division, Meredith Corporation, New York,1971.
15. Lumsdaine, A.A. :Glaser, R. (Eds): Teaching Machines and Programmed Learning: A Source Book, DAVI, Washington, D C, 1960.
16. Rowntree, Derek. : Basically Branching-A Hand Book for Programmers, McGraw Hill Book Com, New York,1963.
17. Taber, J I. Et. AI : Learning and Programmed Instruction.
18. Callender, Patricia, : Programmed Learning; Its Development and Structure, Longmans, Green &Co., London.1969.
19. Unwin, D. And Leedham J (Ed): Aspects of Educational Technology, Metuen &Co. 1, 78,1968.
20. Bjerstedt, AKE. Education Technology, Wiley Intersdence, N. Y.1972.

LESSON NO. 2.3 **AUTHOR:DR.TASNEEM KHAN**

USE OF COMPUTERS

Structure :

2.3.1 Objectives:

After going through the lesson, the students will be able to :

1. know about the meaning of Computers.
2. know the uses of computers in teaching learning process.
3. know the use of system and application software.
4. know the use of Internet in teaching learning process.

2.3.2 Introduction:

Today is the era of Modernisation. In which in each and every field the work is being done easily and fast because different types of machines are used. Computer is one of them. A computer is a device that can receive, process and store data. They are used as a tools with internet. Computer nowdays are complex; there are a lot of different components inside them, and they all serve different purpose.

2.3.3 Meaning of Computer:

Computer is electronic machine operating under the control of instructions stored in its own memory, accepts data manipulates the data according to specified rules produces results stores the results for future use.

Data and Information :

Data : Collection of raw unprocessed facts, figures and symbols.

Information : Data that is organized, meaningful and useful.

Hardware and Software :

Hardware : The electric, electronic and mechanical equipments that wakes up a computer.

Software : The series of instruction that tells the hardware how to perform tasks.

2.3.4 Input and Output Devices:

Output Devices of Computer :

Any hardware component that can convey information to a user.

Example : Monitor, Printer, Speakers

Input Devices of Computer :

Any hardware component that allows a user to enter data and instruction into computer.

For example : (i) Microphone (ii) Keyboard (iii) PC Camera (iv)Mouse

(v) Scanner (vi) Digital Camera

CPU : Central Processing

Unit Meaning of CPU :

CPU stand for "Central Processing Unit". The CPU is the primary component of a computer that processes instructions. It runs the operating system and applications, constantly receiving input from the user or active software programs. It process the data and produces output, which may stored by an application or displayed on the screen. The CPU contains atleast one processor, which is the actual chip inside the CPU that performs calculations.

History of CPU :

When the 1970 dawned, computers were still monster machines hidden in air-conditioned rooms and attended to by technicians in white lab coats. One component of a maniframe computer, as they were known, was the CPU, or central processing unit. This was a steel cabinet bigger than a refrigerator full of circuit boards crowded with transistors.

Components of CPU :

There are three component of CPU :

On a technical level the top three component of CPU are :-

1. Arithmatic Logic Unit (ALU):

The ALU is the part of a CPU that perform all arithmatic computers including addition, subtraction, multiplication and division. The arithmatic logic unit is a bitterly the fundamental building block of the CPU, and even the simplest processors contain and ALU.

In some CPUs an individual ALU is further divided into two units called arithmatic unit and logic unit. Some processors even contain more than one Arithmatic unit.

2. Control Unit:

The CPUs control unit is responsible for executing or storing the result coming out of the ALU. Within the CPU, the control unit performs the functions of fetch, decode, execute and store.

I. **The Program Counter:** Program counter is responsible for tracking what instruction CPU should execute next.

II. **Decode :** CPU understand instruction, that are written in Assembly Programing language. All the program that must be executed are translated to Assembly instruction. Assembly code must be decoded into binary instructions which are understandable to your CPU.

III. **Execute:** During the procedure of instruction execution, three things can be done.

(i) CPU can do some calculations.

(ii) CPU can more data from one memory location to another.

(iii) CPU can jump to different address if it is need.

(iv) **Store:** CPU must give some feedback after executing the instruction. The output data is written to the memory. In this phase program counter is incremented.

3. Registers:

Registers are the temporary storage areas for instructions or data within the processor. Registers are basically special storage locations somewhat similar to a computer's memory through contained within the processor and exceptionally faster.

Register work under the direction of the central unit to accept, hold and transfer instructions or data and perform arithmetic or logical comparison data high rate of speed.

Main Functions of a CPU :

The CPU is similar to human brain. Every single operation that you do with your computer is processed in CPU.

CPU has to implement four basic functions during instruction cycle : fetch, decode, execute and store.

I. Fetch: All the instructions are stored in memory. Each instruction basis address. The processor takes its address number from

System and Application Software :

Introduction :

The term 'software' refers to perform a task or operation. In contrast, the term hardware refers to the physical components that you can see and touch, such as the computer hard drive, mouse and keyboard.

System Software :

System software includes the programs that are dedicated to managing the computer itself, such as the operating system, fill management utilities, and disk operating system. The operating system manages the computer hardware resources in addition to application and data. Without system software installed in our computers we would have to type the instructions for everything we wanted the computer to do.

Application Software :

Application Software are often called productivity programs or end user programs because they enables the user to complete task such as creating documents, spread sheets, data base and publication doing online research, sending email, designing graphics, running businesses and even playing games. When you begin creating a document, the word processing software has already set the margins, font style and size and the line spacing for you. But you can change these setting and you have many more formatting options available. For example, the word processor application makes it easy to add color, headings, and pictures or delete, copy, move

and change the document's appearance to suit your needs.

Functions of Application Software :

The function of application software is to perform specific operations for various applications. These functions include writing reports, creating spreadsheets, manipulating images, keeping records, developing websites and calculating expenses. Example of application software include microsoft excel, microsoft word and desktop publishing applications. Some application software packages concentrate. There are also application packages that focus on multiple tasks, such as database software and web design.

Types of Application Software :

1. **Word Processing Software :** Allows users to create, edit a document. Example : MS Word, Word Padetc.
2. **Spread Sheets Software :** Allows users to create document and perform calculation. Example : Excel, Lotus 1-2-3etc.
3. **Data Base Software :** Allows users to store and retrieve vast amount of data. Example : MS Access, My SQL, Oracleetc.
4. **Presentation Graphics Software :** Allows users to create visual presentation. Example : MS PowerPoint.
5. **Multimedia Software :** Allow users to create image, audio, video etc. Example Real player, Media playeretc.

Difference between System Software and Application Software :

1. System Software gets installed when the operating system is installed on the computer while application software is installed according the requirements of the other.
2. System Software includes programs such as compilers, debuggers, drivers, assemblers while application software includes media players, word processors and spread sheet programs.
3. Generally, users do not interact with system software as it works in the background whereas users interact with application software while doing different activities.

4. A computer may not require more than one type of system software while there may be a number of application software programs installed on the computer at the same time.
5. System Software can run independently of the application software while application software cannot run without the presence of system software.

2.3.5 Use of Computer and Internet and E-mail in Teaching Learning Process:

Use of computers in teaching learning

I. **To replace writing on chalkboard/white board/overhead :** Instead of writing on the board, instructor or a student takes notes on the computer and projects this on to the screen so the whole class can see this purpose:

(i) Enables the student to read what has been written more easily than instructor's hand working.

(ii) Student can work in small groups and use laptop discussion (replacing the use of poster paper or hand writer overhead transparencies). When they share their group's findings with the whole class, they copy their to disk and bring it up to the front of the class to project using the instructor's computer.

II. Power Point to replace slides, pre-prepared overhead transparencies and even video :

(i) Creating own presentation for class.

(ii) Creating own presentation for class and uploading these to course web page.

(iii) Using presentation that come on CD with textbooks.

(iv) Having students create Power Point presentations to give presentation in class and for presenting assignments.

(v) Creating presentation but printing them out and creating overhead transparencies of the slides.

Course Web Pages :

* Either using top class course management system or faculty member creating own site using Pager Millor other web-authority software.
* Having a collection of pages for each course that includes some or all the following : Syllabus, Class Schedule, Assignment, Links to reading, On-line class discussion, posting of student work, on line testing.

Internet

(i) Use of Internet outside the class:

* Required reading (having students read specific web pages as assignment). Especially useful on-line journals (eg ISTE)
* Student research (for sites on specific topics).

(ii) In Class Use :

* Instructor integrating websites into teaching of lesson (projecting sites on the screen).
* Having student use specific sites during class, either workings in groups, using their laptops, or in computer lab, with one or two students per computer.
* Having students integrate web sites into class presentations (so that a student present to the class, they protect the website on to the screen and use this as part of their presentations).

(iii) Online Discussion Forums:

* Using Top Class, Web Crossing, or Tom Bacig's board.
* Students to continue class discussion outside of class.
* Outside "Speakers" can join in class discussion online.
* Using folders within the discussion forums, student can "meet" online to do group projects.

(iv) Student Card Web Pages:

* Student Creating on-line portfolios of their work.

* Class developed "Clearing House" on particular tasks or topics.
* As a means of students sharing their work with peers (for group assignment) or with instructor.

(v) Class E-mail Alias :

* For instructor to provide updates and reminders to students.
* To e-mail students copies of work developed in class.

2.3.6 Summary:

Thus different component of Computer all need to work together for the computer to work, knowing how a computer works makes it easier to use a computer by being able to understand how a computer will respond. Inside computer CPU run the operating system and applications, constantly receiving input from the user or active software programme, system and application software are dedicated to managing the computer itself. With the help of computer and internet teaching learning process become advanced and qualitative.

2.3.7 Suggested Question:

Q.1 What is the meaning of compute, what are the input and output devices. Discuss CPU in detail.

Q.2 How we can teaching learning process effective by the use of internet and computer. Discuss in detail.

2.3.8 Suggested Books:

1. N. Subramanim : Introduction to Computers
2. Jones, Graham : How to Use the Internet
3. Neogy, Jayant : How best to use the internet and e-mail

M.A.(Education)Part-II **PAPER-I**

ICT in Education

LESSONNO. 2.4 **AUTHOR: Dr. Pinki Malik**

Multimedia Programmes in school situation, Pedagogies using ICT in classroom, Academic and research content on the web

Structure of the Lesson

2.4.1 Objectives

After going through this lesson, the learner would be able to:

i. Define the concept and uses of Multimedia in classroom
ii. Understand about the effects of technology on classrooms and students
iii. Know the Multimedia Courseware

iv. Know the Pedagogy using ICT in classroom
v. Get acquainted with the Academic and Research content on the Web
vi. Maximise the learning capability of Learners.

2.4.2 Introduction

Computers along with internet can bring the revolutions in the traditional classrooms. Multimedia programmes also help in imparting and conveying educational programmes successfully to the students. ICT based Pedagogical innovations has brought so many innovations in educational experiences. The reflection of these revolutions can be observed and recognized in pedagogical designs of teaching strategies, instructional leadership, assessment strategies, teacher taught relationship along with vibrant and dynamic classrooms. As well the academic and research content available on the web is doing a remarkable job for the learners at different levels. And above all these services are only possible with the help of internet resources.

2.4.3 EDUCATIONAL SATELLITE (EDUSAT)

The Educational Satellite (EDUSAT or GSAT-3) was launched by the Indian Space Research Organisation (ISRO) on 20th September 2004 from the Sri Harikota Space Research Centre located in Andhra Pradesh, using a G.S.L.V. rocket. EDUSAT is the first dedicated "Educational Satellite" that provide the country with satellite based two way communication to class room for delivering educational material. It is meant for distant class room education from school level to higher education. It is a Geo-synchronous satellite developed on I-2K bus. GSAT-3 is co-located with METSAT (KALPANA-1) and INSAT-3C at 74^{o} E longitude. The main purpose of this is to provide education to all people, primarily children from remote areas of the country who cannot go to schools or colleges. Many classes are conducted by various State Education Boards, NCERT, CBSE, Universities etc. in a studio environment using power point presentations as well as the common blackboard. Both interactive as well as non-interactive sessions are offered. As classes are conducted in a studio environment, it is enough to use the services of a few highly qualified competent teachers and telecast the proceedings to the entire nation. This eliminates the need for a large number of qualified teachers often demanded in other forms of education. These classes are beamed to predestined areas using EDUSAT similar to regional television programmes on 'Doordarshan'. Students attending the classes could ask questions to the teachers conducting classes through SMS, e-mail or other electronic mode of communication, something similar to a TV talk show. To enable this, schools / colleges should be having an interactive receiving terminal which is currently being supplied free by ISRO to selected schools / colleges as the whole programme is at an experimental stage. In addition, some classes could be recorded on a CD and converted into computer file and made available on the internet without the interactive session.

In a nutshell it could be said that Indian Government is making all out preparations to provide education to all, at a fraction of the present cost using space technology.

Lectures on different topics from different subjects like Physics, Chemistry, Management, Hindi Lit., English Lit., Mass Communication, Genetics, Bio-informatics, Economics, Political Science, Sociology, Psychology, Library Science etc. are being delivered on the Consortium for Educational Communication (CEC) network. CEC is also providing a service called 'Lecture on Demand (LoD)' and these lectures are demanded by the students and faculties of various colleges and departments of universities across the country.

2.4.3.1 OBJECTIVES OF EDUCATIONAL SATELLITE SYSTEM

Following are the objectives of Educational Satellite System to meet the challenges of number and quality of education through-

- Improving the level of science education among the students, as well as to improve English.
- To ensure that teacher absenteeism does not disturb the study of children.
- Reviving the interest of children in classroom studies.
- Providing quality teacher training, so as to improve the subject knowledge of the teachers, as well as to train them to use ICT in education.
- To familiarize children about appearing in examinations with 'objective type' questions.
- To provide access to quality education, particularly for far flung/remote location schools.
- Supplementing the curriculum based teaching.
- Greater community participation and monitoring.
- Providing access to quality resource persons (higher & professional education).
- Strengthening the distance education efforts initiated by various agencies.
- Providing access to new technologies.

2.4.3.2 CHARACTERISTICS OF EDUSAT (EDUCATIONAL STATELLITE)

- EDUSAT is the first exclusive satellite for serving the educational sector in India. Growing demand for an interactive satellite based distance education system through audio-visual medium, employing Direct To Home quality broadcast prompted the government to launch it.
- EDUSAT is a collaborative project of ISRO, the Union ministry of human resource development, state departments of education and the Indira Gandhi National Open University.
- The satellite has multiple regional beams covering different parts of India -- five Ku-band transponders with spot beams covering northern, north-eastern, eastern, southern and western regions of the country, a Ku-band transponder with its footprint covering the Indian mainland region and six C-band transponders with their footprints covering the entire country.
- The EDUSAT satellite in orbit carries six KU-band transponders and six extended C-band transponders. The transponders are dedicated to specific regions of India. The satellite utilises an antenna with a 1.2-metre reflector to direct the KU-band

spot beams towards their intended regions. This enables information to be broadcast in all the 18 officials' languages of India. The educational programmes then can be viewed on any television set installed in schools, homes or community halls through a simple low-cost receiver.

- Different agencies have been identified for implementing the EDUSAT Project. The State council of Educational Research and Training is entrusted with the responsibility for the development of Software, Teacher Training, Monitoring & Evaluation and overall implementation of the project. Indian Space Research Organisation (ISRO), Serva Siksha Abhiyan (SSA) are also involved in the implementation the Programme. Each of these agencies was entrusted with certain tasks for facilitating the implementation.

2.4.3.3 ADVANTAGES OF EDUSAT (EDUCATIONAL STATELLITE)

- Education could be made available at a fraction of its cost to a large number of students.
- A large number of students can be educated by a very few extremely efficient teachers who can reach them from the studios located in the universities or education boards i.e. it eliminates the demand for a large number of teachers.
- Distance education will get strengthened.
- Education reaches the door steps of students; there is no need for students to go in search of good education.
- Students can receive education at their own pace and convenience especially in the case of those who are employed.

2.4.4 Multimedia Programmes in School Situation

Multimedia can be defined as the integration of text, graphics, animation, sound or video. Text is the most common multimedia element. Multimedia in the classroom include Power Point presentations that are created by the teacher, and used for reference or instruction, or activities that directly engage the students in using multimedia to construct and convey knowledge. The main objective of multimedia is to engage students in the use of multimedia to construct and convey knowledge.

2.4.4.1 Uses of Multimedia in the Classroom

Multimedia activities encourage students to work in groups, express their knowledge in multiple ways, solve problems, revise their own work, and construct knowledge. The advantages of integrating multimedia in the classroom are many. Through participation in multimedia activities, the following behavioural changes can be observed among the students. They will be able to:

- Analyse the importance of research, planning, and organization skills.
- Evaluate the significance of presentation and speaking skills.
- Accept challenges of communication to different audiences.
- Learn how to present information in convincing ways.

- Learn techniques for synthesizing and analyzing the complex subject matter.
- Understand real-world skills related to technology in a meaningful way.
- Recognise the value of team work.
- Explore effective collaboration techniques.
- Identify impact and importance of different media.
- Learn how to express their ideas innovatively in a group as well individually.
- Increase Motivation and Self Esteem.
- Accomplishment more Complex Tasks.
- Improve the Design Skills.
- Learn how to admit and provide productive feedback to others.

However there are some **constraints** in using multimedia in the classroom which includes:

- Inadequate technological resources, both hardware and software
- Incompetency in handling technological skills.
- Insufficient time is there to plan, design, develop, and evaluate multimedia activities.

2.4.4.2 Multimedia Courseware

Multimedia is very much helpful in the development of courses and academic assignment. Courseware is educational material intended as kits for teachers or trainers or as tutorials for students, generally packaged for use with a computer. Courseware can encompass any knowledge area, but information technology subjects are most common. Courseware is frequently used for delivering education about the personal computer and its most popular business applications, such as word processing and spreadsheet programs. Courseware is also widely used in information technology industry certification programs, such as the Microsoft Certified Systems Engineer and the Computing Technology Industry Association examination. Courseware can be in the form of a Flash Drive, Compact Disk or material placed Online. Courseware includes:

- Subject material for instructor-led classes
- Content for self-directed Computer-Based Training (CBT)
- Web sites that offer interactive tutorials
- Subject material that is coordinated with distance learning, such as live classes conducted over the Internet
- Videos for use independently or as part of classes

The **CD-ROM** is the most common means of delivering courseware that is not offered online. For teachers and trainers, courseware content may include set-up information, a course plan, teaching notes, and exercises. The Term courseware is given to materials which are part of an educational course or class. Courseware can be supplemental to traditional classroom taught courses, or can be stand alone courses themselves.

2.4.5 Pedagogy using ICT in classroom

'Information Communication Technology' is the extension of term 'Information Technology' and has addition of one more acronym 'Communication'. Information technology generally refers to the use of computer for storing and sharing data or information. It may be defined as the entire information domain which includes software, hardware and networking. The term ICT includes other communication devices like radio, television, smart phone along with computer for receiving, storing, retrieving, manipulating and transmitting information digitally.

The modern trends in form of online courses, e- learning technologies, social networking tools, and other emerging technologies are being popular among the young generation and further leads to technology supported pedagogical innovation with full access of information communication technology. There is variety of digital tools and technologies available for making pedagogical designs and planning instructional practice for excellent educational experiences. Here we will discuss some digital tools which can be of use in this regard.

2.4.5.1 Virtual Learning Tools

Learning Management system: When learning material and learning experiences are transacted through internet or web, it is called Virtual Learning Environment. This is also called Learning Management System and Content Learning Management System. The main characteristics of this LMS are Rubrics, teacher and student role, a discussion board, educational resources along with variety of functionality. It is of both types; paid as well as free of cost. A few Examples are:

- Moodle
- Google Classroom
- Zillearn
- Canvas
- Open edx
- Chamilo
- Creative cloud

We can discuss 'Moodle' for understanding the concept. It stands for "Modular Object Oriented Dynamic Learning Environment". Moodle was developed to help educators to create online courses. Moodle is a "free and open source of learning management system" have general public license. Moodle can be used in various ways in the classroom for flipped classroom, blended learning, distance learning and other e-learning projects in schools, workplace, institutions, and universities and other sectors. It is used to create a private websites by trainers to achieve learning goals. The first version of Moodle was released on 20 August 2002 and continues evolution with the changing world.

2.4.5.2 Lecture Capture tools

It is concerned with a process which is used for recording classroom lectures as a

video lesson. After the class, these videos can be seen and reviewed by the students. Lecture Capture Tools allow instructors to create recordings of classroom lectures or presentations, including audio, video and screen content, and share them with students online. Some of Examples are:

- Screencastify
- Screencast-o-matic
- CamStudio
- Presentaion Tube

Some of the most commonly used online face to face teaching-learning platforms are:

- Zoom used for reliable, large video calls.
- Google Hangout Meet also used for video chat for larger groups.
- Webex used for white boarding.
- Go To Meeting used for professional features.

2.4.5.3 Social Media Tools

Social media tools helps in boosting the educational experiences in more classy way. In this new age, where learners are digital native, social media may be highly utilized as a pedagogical tool where students would not get only information from his teachers but share, collaborate, reflect and apply with broader community and learns life skills. There are various tools from which teachers can sharpen 4Cs of 21st century skills as Critical Understanding, Communication, Creativity, Collaboration etc. Examples of these are as follows:

- Facebook
- Twitter
- Blooger
- Youtube
- Instagram
- Teacher Tube
- Pinterest
- Podcasts
- EduBlogs

2.4.5.4 Digital Resources sustain teaching and learning

Digital resources can be highly utilized in a variety of ways to support teaching and learning. Electronic grade books, digital portfolios, learning games, and real-time feedback on teacher and student performance can be used to empower learning. Here are some examples of digital resources to support teaching and learning.

Presentation Software: This is a software package which is used to exhibit or display information in the form of a slideshow or video. It has three main characteristics as text editor, graphic images, music tune that support teaching learning resources in a brilliant way. Examples of these are PowerPoint, PREZZI, Slide share, Keynote, etc.

YouTube Videos: By utilization of YouTube video as educational resources, we can explore new connections between curriculum topics and world outside from the classroom.

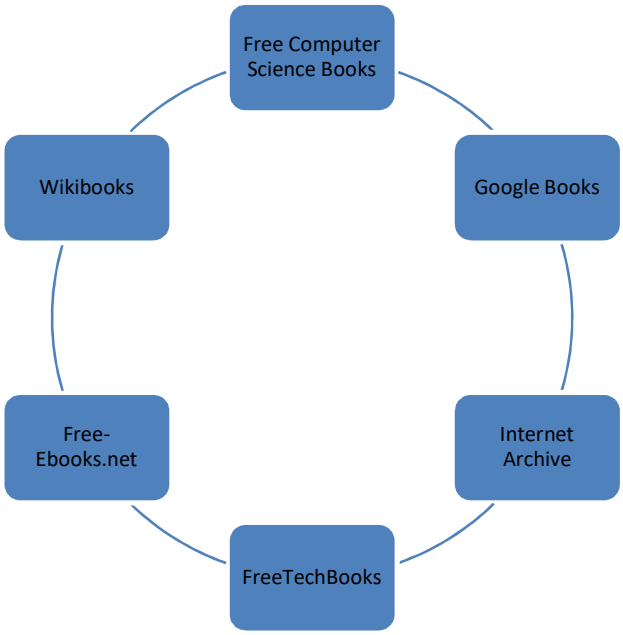
Storyboard: A storyboard is a graphic manager in the form of illustrations or images displayed in series for the purpose of pre-visualizing of motion picture, animation, motion graphic or interactive media sequence. Storyboards can be simple or complex. It is hand-drawn, but we can use story board software to create images for making video.

Computers along with internet can bring the revolutions in the traditional classrooms. ICT based Pedagogical innovations has brought so many innovations in educational experiences. The reflection of these revolutions can be observed and recognized in pedagogical designs of teaching strategies, instructional leadership, assessment strategies, teacher taught relationship along with vibrant and dynamic classrooms.

2.4.6 Academic and Research Content on the Web

A website is a collection of web pages and related content that is identified by a common domain name and published on at least one web server. Notable examples

are wikipedia.org, google.com, and amazon.com. Nowadays almost every organization whether it is private or governmental, they have their own websites on which they display all the day today information about their company or organization. Websites are typically dedicated to a particular topic or purpose, such as news, education, commerce, entertainment, or social networking. Users can access websites on a range of devices, including desktops, laptops, tablets, and smart phones. The software application used on these devices is called a web browser like opera, chrome, internet explorer etc. Sites with free e-Books as follows:



2.4.6.1 Introduction of Web Content, Academic Content Website and Research Content website

Web content is the textual, visual content that is encountered as part of the user experience on websites. It may include text, images, sounds, videos, and animations.

Academic Content Website: Content is something that is to be expressed through some medium, as speech, writing or any of various arts. If we use the website academically, than the content related to academic purposes can be displayed on the concerned sites. Students as well teachers, academicians any one can refer these sites for their content expansion, information and knowledge.

Research Content Website: It is also same as Academic Content Sites but only the difference is it includes activities related to research where a research topic is identified, and an attempt is made to actively gather information for the purpose of additional understanding. All the students are turning to the Internet when doing research for their coursework, and instructors are requiring such research when selecting topics. However, research on the Net is very different from traditional Library research. The Net is a remarkable resource, but it must be used vigilantly and decisively. A researcher must know the rules of copyright during to do so.

The Government of India is keen to use the technological resources in helping its mission to make Higher Education accessible to all deserving students. In this regard, it has launched its National Mission on Education through Information and Communication Technology (NMEICT) in 2009 to provide the opportunity for all the teachers and experts in the country to pool their collective wisdom for the benefit of every Indian learner. Under this Mission, a proper balance between content generations, research in critical areas relating to imparting of

education and connectivity for integrating knowledge with the advancements in other countries is to be attempted.

2.4.6.2 ICT Initiatives of MHRD & UGC Related to Academic and Research Content

1. SWAYAM: Massive Open Online Courses

SWAYAM MOOCs platform is World's Largest Online Free E-Learning Platform Portal designed to achieve the three cardinal principles of Education Policy viz., Access, Equity and Quality by covering School/Vocational, Under-Graduate, Post Graduate, Engineering and Other Professional Courses. Some of the benefits of MOOCs are given below:

- Earn credit through online courses
- Encourage extraordinary faculty to develop online courses
- Audio-Video e-content

2. Swayam Prabha

SWAYAM PRABHA has new content everyday on the channels for at least (4) hours which would be repeated five more times in a day, allowing the students to choose the time of their convenience. The contents are provided by NPTEL, IITs, UGC, CEC, IGNOU, NCERT and NIOS. The INFLIBNET Centre maintains the web portal. These DTH channels helps at different levels of education like:

- **School education (9-12 levels)**: Many modules are available for teacher's training as well as teaching and learning aids for children of India to help them understand the subjects better and also help them in preparing for competitive examinations for admissions to professional degree programmes.
- **Higher Education**: Curriculum-based course contents at post-graduate and under-graduate level covering diverse disciplines such as arts, science, commerce, performing arts, social sciences and humanities, engineering, technology, law, medicine, agriculture, etc
- **Curriculum-based courses** that can meet the needs of life-long learners of Indian citizens in India and abroad.

3. National Digital Library

The **National Digital library of India** (**NDLI**) is a project under Ministry of Human Resource Development, India. The objective is to collect and collate metadata and provide full text index from several national and international digital libraries, as well as other relevant sources. It is a digital repository containing textbooks, articles, videos, audio books, lectures, simulations, fiction and all other kinds of learning media. Uses of NDL are given below:

- Access e-content on multiple disciplines
- Get your E-content listed
- Form NDL Club

4. e-PG Pathshala

e-PG Pathshala is an initiative of the MHRD under its National Mission on Education through ICT (NME-ICT) being executed by the UGC. The content and its quality being the key component of education system, high quality, curriculum-

based, interactive e-content in 70 subjects across all disciplines of social sciences, arts, fine arts and humanities, natural & mathematical sciences. Uses of e-PG Pathshala are:

- Gateway for e-books upto Post graduate level
- Get free books and curriculum-based e-content
- Host e-books

5. Shodhganga is a website used for research purposes. It is :

- A reservoir of Indian Theses
- Access Research Theses of scholars of Indian Institutes
- Get research theses of your scholars to get listed on Shodhganga

6. e-ShodhSindhu contains

- E-journals
- Get access to full text e-resources
- Get access to full-text e-resources

7. VIDWAN explores

- Expert Database and National Research Network
- IRINS: Indian Research Information Network System
- Get your faculty registered on VIDWAN
- Monitor research outcomes at different levels

8. Shodh Shudhhi used for

- Plagiarism Detection Software
- Unique ideas, concepts and information without duplication.
- Encourage original information by preventing plagiarism.
- Chance for better research outcomes.

There are some other platforms used for skill development and Accelerated Hands on learning like **e-Yantra, Spoken Tutorial, Virtual Labs, and E-Governance etc.** Simultaneously there are so many private and public websites which provide data for academic and research purposes here some examples are given below:

1. Google Scholar: Google Scholar was created as a tool to collect scholarly literature on the web.
2. Google Books
3. Microsoft Academic
4. World Wide Science
5. Science.gov.
6. Wolfram Alpha
7. Refseek
8. Educational Resources Information Center
9. Research gate
10. EdX: edx.org.
11. Academic Earth: academicearth.org.
12. Internet Archive: archive.org.
13. Big Think: bigthink.com.
14. Coursera: courser.org.
15. Bright storm: brightstorm.com.
16. Cosmo Learning: cosmolearning.com.
17. Futures Channel: thefutureschannel.com

2.4.7 Summary

In general, Web pages and documents on the Internet that provides useful information. Electronic resources (or e-resources) are materials in digital format accessible electronically. Examples of e-resources are electronic journals (e-journal), electronic books (e-book) online databases in varied digital formats, Adobe Acrobat documents (pdf), WebPages (html, etc) and more. There are so many factors responsible for unsuccessful implementation of these resources like Lack of knowledge regarding pedagogical skills on the part of teachers, non- favourable attitude of teachers, lack of ICT facilities in schools and lack of time are some major constrains in this regard. Among these hindrances lack of knowledge of teachers regarding pedagogical knowledge with reference to ICT demands high attention as it is one of the basic necessities in practicing the skill. Multimedia courseware and internet resources can bring revolutionary changes in the process of teaching learning process. It is also helping to shift from traditional classroom to ICT enabled classroom.

"Technology will never replace great teachers, but technology in the hands of great teachers is transformational"

By: George Couros

2.4.8 Suggested Questions

Q.1. Define the concept of Multimedia.

Q.2. How Multimedia courseware is beneficial in school situation?

Q.3. Classify the different e-tools with their characteristics.

Q.4. Name some lecture capture tools of teaching.

Q.5. Explain the concept of Web content.

Q.6. Discuss Swayam Prabha as an educational portal along with its advantages.

Q.7. Highlight the characteristics of e-PG Pathshala.

Q.8. Describe the ICT initiatives of MHRD & UGC in detail.

2.4.9 Suggested readings

https://en.wikipedia.org/wiki/Content_(media)
https://en.wikipedia.org/wiki/Internet_research
https://mhrd.gov.in/technology-enabled-learning
https://mhrd.gov.in/ict-initiatives
http://mooc.nios.ac.in/mooc/
https://www.aicte-india.org/bureaus/swayam
https://www.mooc.org
https://vikaspedia.in/education/interactive-resources/swayam-prabha
https://swayam.gov.in/nc_details/CEC
https://www.indiatoday.in/education-today/featurephilia/story/free-education-953499-2017-01-06