INDIVIDUALISED INSTRUCTION

The improvement of instruction has been a goal of educators as far back as the teachings of the Greek philosopher Socrates. Although there are a wide variety of approaches, in most cases instruction can be characterized by the following tasks: setting objectives, teaching content based on these objectives, and evaluating performance. This formula is indeed the most common; however, there have been many advocates of alternative approaches. Among the alternative approaches there is a focus on a more individualized approach to instruction, where the traits of the individual learner are given more consideration. Each approach to individualizing instruction is different, but they all seek to manipulate the three following fundamental variables:

Pace

There are two basic extremes when the pace of instruction is considered. The first is when someone other than student, usually a teacher or instructor, controls the amount of time spent learning the material. In this case specific due dates are defined before instruction begins. This is currently the predominant model in most educational systems. The opposite extreme would be if the learner had exclusive control over the pace of instruction, without a time limit. Between these two extremes are situations where control of the pace of instruction is shared or negotiated, not necessarily equally, by the teacher and learner.

Method

As theories of learning and instruction develop and mature, more and more consideration is given to the way in which learning occurs. In an attempt to account for the way that students learn, instructors may apply a combination of theories and principles in preparing instruction. This can influence whether instruction is designed for one homogenous group, or is flexible, in anticipation of individual differences among learners. In the majority of cases, instruction is designed for the average learner, and is customized ad-hoc by the

teacher or instructor as needed once instruction begins. This type of instruction, although it does give some consideration to individual differences among learners during instruction, does not fall into the typically accepted definition of individualized instruction. For instruction to be considered individualized, the instruction is usually designed to account for specific learner characteristics. This could include alternative instructional methods for students with different backgrounds and learning styles.

To help clarify this point, the instructional method used can be considered in terms of extremes. In the first extreme, one instructional method is used for everyone. Terms like *inclusion* and *mainstreaming* have been used to describe this first case. In the second extreme, a specific instructional method is used for each individual. Between these extremes lie situations where students are arranged into groups according to the their characteristics. These groups can vary in size, and the instructional method is tailored to each group.

Content

Perhaps the least frequently modified component is the actual learning content. However, it is possible to vary the content taught to different learners or groups of learners. Both "tracking" and "enrichment" are examples of customizing instructional content. A renewed movement toward learner-centered principles in education has given this component more consideration in the 1990s. It has become possible to find examples of instructional settings in which students define their own content, and pursue learning based on their own interests. In most cases, however, this opportunity is limited to high-achieving students. In terms of extremes, content can be uniform for everyone, or unique to each individual. Between these extremes lie cases where the content can be varied, but only within a predefined range. The range of activities available to the learner is an indicator of how individualized the content is in an instructional setting.

Examples of Individualized Instruction

There are many examples of instructional approaches that have modified some or all of these three components. In all of these examples, the goal was to improve the instructional experience for the individual learner. Some of the most historically notable approaches are discussed below. Within each example both the benefits and criticisms of each approach are discussed.

Personalized System of Instruction.

Introduced in 1964 by Fred Keller, the Personalized System of Instruction, or the Keller Plan, is perhaps one of the first comprehensive systems of individualized instruction. Keller based his system on ten accepted educational principles:

1. Active responding
2. Positive conditions and consequences
3. Specification of objectives
4. Organization of material
5. Mastery before advancement
6. Evaluation/objectives congruence
7. Frequent evaluation
8. Immediate feedback
9. Self-pacing
10. Personalization

None of these ten principles should be considered unique, as they all can be easily found in other more traditional educational settings. Rather, it is the components of the Keller plan–based on these ten principles–that makes the Keller Plan somewhat different: self-pacing; unit mastery; student tutors; optional motivational lectures; and learning from written material. It is the first component, self-pacing, that is the most obvious attempt at

individualizing the instruction. From the second component, unit mastery, it can be seen that the content does not vary, as the unit content is fixed. To illustrate the static nature of the content, Mike Naumes describes the basic design of a course using Keller's personalized structure of instruction, breaking the material of the course into several units…. dividing the material in to units one to two weeks long…. [and] a large unit of material is covered, specific learning objectives are given to the students. These state exactly what a student must know to pass a unit quiz.

The last three components indicate that the method of instruction does vary slightly from individual to individual. Although all students learn from written material and student tutors, the motivational lectures are optional. Making these lectures optional does constitute some flexibility in terms of instructional method, albeit extremely limited. Fundamentally, it is the self-pacing that more or less stands alone as the individualized component of this instructional system.

Proponents of the Keller Plan cite many benefits, including better retention and increased motivation for further learning. At the same time, there are others with criticisms of the Keller Plan such as the following: limited instructional methods, high dropout rates, and decreased human interaction. The debate over the effectiveness of Keller's Personalized System of Instruction, with its advantages and disadvantages, raises fundamental questions about the nature of self-contained, self-paced learning. There are indeed opportunities for designing instruction that lend themselves to the Personalized System of Instruction approach. This would apply especially to cases where enrollment is high, course material is standardized and stable, and faculty resources are scarce. On the other hand, when there is not a shortage of faculty, or the class size is not large, the course would be better taught with more conventional methods, yet still based on sound educational principles. Where the line is drawn on the continuum between these two extremes is a matter of opinion, and should be

based on the context in which the instruction is to take place. It would be inappropriate to claim that one of the extremes is completely right, and the other wrong, given the vast number of studies and evaluations that support either side.

Audio-Tutorial.

Audio-Tutorial is a method of individualized instruction developed by Samuel N. Postlethwait in 1961 at Purdue University. His goal was to find an improved method of teaching botany to a larger number of college students and to effectively assist the students who possessed only limited backgrounds in the subject. The development of an Audio-Tutorial program requires a significant amount of planning and time by the instructor. Although there is some room for modification for each specific program, the general principles remain the same. Students have access to a taped presentation of a specifically designed program that directs their activities one at a time. The basic principles of Audio-Tutorial are "(1) repetition; (2) concentration; (3) association; (4) unit steps; (5) use of the communication vehicle appropriate to the objective;(6) use of multiplicity of approaches; and (7) use of an integrated experience approach".

The major benefits of Audio-Tutorial are that "students can adopt the study pace to their ability to assimilate the information. Exposure to difficult subjects is repeated as often as necessary for any particular student". In addition to taking more time if they wish, students can also accelerate the pace of their learning. Other benefits are that students feel more responsible for their learning, and more students can be accommodated in less laboratory space and with less staff.

Some of the major criticisms that are common to Audio-Tutorial courses were illustrated by Robert K. Snortland upon evaluating a course in graphics design. The primary criticism concerns the claim of responsibility. It seems that some students respond to the responsibility placed upon them, while others do not. There was a problem with the initial

dropout rate, which seemed to be explained by the lack of willingness of some students to take on the amount of responsibility that was required in order to complete the course. Snortland advised that "since many freshmen students are not ready for additional self-discipline required of them in the A-T format, the choice of either a structured approach or an individualized approach should always remain open. Many other criticisms of Audio-Tutorial courses are concerned with teacher control. The instructor dictates all of the material including the learning and feedback procedures. The criticism is that this is a severe form of teacher control over the student.

Like the Keller Plan, Audio-Tutorial allows the individual student to determine his or her own pace, and the content is fixed. Unlike the Keller Plan, however, there are more instructional delivery methods available when designing the course. Yet the locus of control remains with the instructor in the Audio-Tutorial as well.

Computer-Assisted Instruction (CAI).

Most proponents of individualized instruction saw the computer as a way to further improve the design and delivery of individualized instruction–now in an electronic environment. With the advent of the computer came the potential to deliver individualized instruction in a more powerful way. This potential was anticipated long before the proliferation of the home computer. John E. Coulson wrote in 1970: "A modern computer has characteristics that closely parallel those needed in any educational system that wishes to provide highly individualized instruction". He also noted the specific benefits that the computer could offer:

1. "It has a very large memory capacity that can be used to store instructional content material or…to generate such material."
2. "The computer can perform complex analyses of student responses."

3. "The computer can make decisions based on the assessments of student performance, matching resources to individual student needs."

Although there were many anticipated benefits to using the computer to deliver instruction, in practice, CAI has been heavily criticized for its hidden side-effects. These are nicely articulated by Henry F. Olds:

Learning is in control of some unknown source that determines almost all aspects of the interactive process. To learn one must suspend all normal forms of interaction and engage only in those called for by the program. Learning is an isolated activity to be carried on primarily in a one-to-one interaction with the computer. Normal inter-human dialogue is to be suspended while learning with the computer. Learning involves understanding (psyching out) how the program expects one to behave and adapting one's behavior accordingly. One must suspend idiosyncratic behavior. Learning (even in highly sophisticated, branching programs) is a linear, step-by-step process. In learning from the computer, one must suspend creative insights, intuitions, cognitive leaps, and other nonlinear mental phenomena.

Olds even offered some solutions to these problems, indicating that "time on-line needs to be mixed with plenty of opportunities for human interaction" and that computer should allow people to "jump around within the program structure".

CAI became the forerunner in individualized instruction during the 1980s and early 1990s, as the home computer became more powerful and less expensive. The changes that the computer environment helped to make were predominantly a change in the delivery mechanism of individualized instruction, rather than a fundamental change in purpose or method. In a sense, the computer, especially the home computer, offered a convenience that other delivery mechanisms lacked. This convenience was accelerated with the proliferation of the Internet in late 1990s. Starting as an extension of computer-based instruction, online

education became increasingly popular and eventually began to supplant CAI as the predominant form of individualized instruction.

Distance education.

A surge in the number of nontraditional students attending college in the 1990s, combined with the technological potential of the Internet, has caused a renewed effort to deliver instruction in a nontraditional fashion. Accessibility and convenience–not research–are the primary driving forces in this movement toward instruction in the form on online education. When reviewing more than 200 articles on online instruction over the 1990s, James DiPerna and Robert Volpe found that only one article directly addressed the impact of the technology on learning. Partnerships between businesses and institutions of higher learning have arisen to address the increased need for continuing education.

Whether it is more effective or less effective than traditional education seems less a concern. In many cases, the audience addressed is nontraditional, and they have limited access to traditional education. Additionally, many students who could otherwise attend brick-and-mortar institutions are choosing online education for the convenience. In other words, what was established initially due to necessity has now expanded as students choose this route because of its convenience. The rate of expansion of online education has accelerated to a point where the general feeling among institutions of higher learning is of willing participation. In terms of pace, method, and content, there is a large variety of competing approaches to distance education, and no dominant model has emerged. Like previous iterations of individualized instruction, it is usually the pace of instruction that most often varies. The content is still fixed in most cases, as is the method (predominantly via the Internet).

PROGRAMMED INSTRUCTION

HISTORICAL BACKGROUND.

The term programmed instruction has been coined from principles of operant learning, developed in psychological laboratories on the basis of experimental studies conducted on animals by B.F. Skinner of Harvard University. These have been applied with considerable success to the development of self-instructional programmed books and teachmg machines. B.F. Skinner and his associates had first started 'programmed learning' in 1943 by conditioning a pigeon to role a small bowling of shaping behaviour in a laboratory experiment. It brought the strategy of programmed instructions. B.F. Skinner attended the opening day at his daughter's schools. He found that most of the class-room teaching is ineffective. He wanted to improve the classroom instruction and teaching.

He attempted to apply his operant conditioning theory of learning to teaching and preparing instruction. He published a paper entitled 'Science of Learning and Art of Teaching.' It provided the momentum to the concept of programming. He claimed that desirable change can be brought out by giving a continuous feed-back or reinforcement for desired responses. The operant conditioning is more significant for human learning. B.F. Skinner (1954) attempted to apply the principles of learnmg to education and to the use of teaching machines. Thereafter, Sidney L. Pressey designed a teaching machine for testing purpose. While Skinner has not emphasized assignments and questions for assessing the student performance. B.F. Skinner tried 'Linear Programming'. Norman A. Crowder (1964) a psychologist in U.S.A. developed a new strategy known as 'Branching Programming' or 'Intrinsic programming'. He laid emphasis on task analysis rather than learning condition. In this technique, content is presented and multiple choice questions are asked to diagnose and to learner could follow or not. If he could not follow, the remedial

instruction is given for improving the learning outcomes. Thus, programmed learning is also named as programmed instruction and instructional technology. The idea is that since teaching is broad, vague and ill-defined term, instruction is a purposeful, orderly and controlled sequencing of experiences to reach a specified goal.

DEFINITION

1. Smith and Moore, "Programmed Instruction is the process of arranging the material to be learned into a series of sequential steps, usually 1t move the students from a familiar background into a complex and new I set of concept, principles and understanding."

2. Susan Markle, "Programmed learning is a method of designing a reproducible sequence of instructional events to produce a measurable and consistent effect on behaviour of each and every acceptable student."

3. Harold W. Bernard, "Programmed learning refers to the arrangement of instructional material in progressive sequences."

4. Michael J. Apter, "Programmed instruction is a method of instruction in which the information to be taught is broken into small units which are to be presented to the student (usually in written form) in a carefully planned sequence. Each unit or 'frame' contains not only information but is also terminated with a question." To include on the basis of the above definitions, programmed learning 1s a method of individualized instructions in which the educand receives information relating to his own needs in progressive sequences but in small units. The educand remains active and proceeds at his own rate. He knows immediately, whether he is right or wrong. Thus, programmed learning is a method which makes effective use of programmed books, language, laboratory teaching machines, films, radios, televisions, tape-recorders and the teachers.

CHARACTERISTICS

NEGATIVE CHARACTERISTICS

1. Not a Test-It is a teaching method and not a test. It helps the students in learning the material.

2. Not an Audio-visual Aid-It is not a part of the new technology of educatioon

3. Not a Panacea-It is not a technique of imparting knowledge.

The educands learn at their own rate. The gifted educands learn quickly and backward educands learn at a slower rate**4. Not a Solution-Not** a solution for shortage of capable teachers.

POSITIVE CHARACTERISTICS

1. Individualized Instructions-It is method of individualized instructions. It is information presented according to individual needs. It maximizes the rate and depth of learning. It motivates the students and fosters understanding.

2. Logical sequence of material The subject-matter of programmed learning is presented into logical sequence of small steps. By proceeding in small steps, the possibility of committing error is eliminated.

3. Interaction between the learner and the programme In programmed learning, emphasis is laid upon interaction between the learner and the programme. It requires that the learner should be active.

4. Immediate knowledge of results-Programmed learning provides immediate knowledge of results. At each step, the educand is informed of how he is doing. He immediately knows whether his answer to a question is right or wrong.

5. Organized nature of knowledge-Programmed learning lays emphasis upon the organized nature of knowledge. It requires continuity between the easier concepts and the difficult ones.

6. Learner's own speed, The learner moves at his own speed in programmed learning situation. Thus, learning takes place at individual rather than general rates.

7. Constant evaluation-Constant evaluation is possible by the record of student's responses in a programmed material. It is possible to improve the quality of programmed materials through checking the number of errors at each step. Thus, student's progress may be evaluated by looking into the various types of responses produced by the learner.

FUNDAMENTAL PRINCIPLES

1. Small steps- A programme is made up of large number of small and easy steps. One learns better in small steps, since the likelihood of errors is reduced in small steps.

2. Active response-Programmed learning is based on the principle of active response. A student learns better if he actively participates in the lesson and he learns best if he is actively responding while learning.

3. Immediate confirmation As the student learns best if his answer is confirmed immediately. Therefore, immediate confirmation serves as a kind of motivation or reinforcement.

4. Self-pacing In programmed learning, each student proceeds at his own rate or pace. It is common knowledge that some students naturally learn more rapidly or more slowly than others. One learns most effectively if one learns at one's own pace. This principle is based on individual differences in the process of teaching and learning.

5. Evaluation Constant evaluation is yet another fundamental principle of programmed learning. It helps students to learn and grasp the material given in each frame. The aim of this arrangement is not to test the student but to improve the quality of programmed materials through checking the number of errors at each step.

ASSUMPTIONS

Programmed Instruction assumes that a student learns better under the following situation—

1.By being active.

2. If he is motivated to learn by confirming his responses.

3. If the content matter is presented in small step.

4. If he commits minimum errors in his learning.

5. If the sequence of content is psychological valid.

6. If the pre-requisite are specified on the part of the learner.

OBJECTIVES

1.To help student to learn by doing.

2. To provide the situation to learn at his own pace.

3. To help student to learn without the presence of a teacher.

4. To present the content in a controlled manner and in logically related steps.

5. To study by himself and assess his own performance by comparing it with the given answer.

TYPE OF PROGRAMMING

The following are the main types of programming

1. **Linear Programming** This was developed and used by Skinner and his associates. In the linear style, the subject-matter is divided into very small steps, each of which is called a frame. Each frame, in its turn requires the student to do something. When the student has given his response, he confirms it with the correct response provided in the programme. There is provision for self-pacing. Therefore, the linear programmed learning has all the principles mentioned below—

(i) Information given in small steps.

(ii) Active responding the student at each step.

(iii) Immediate knowledge of results.

(iv) Self-pacing.

2. **Branching Programming-** The branching or intrinsic style (method) of programming is invented by Norman A. Crowder. He defined it as a programme which adapts to the needs of the students without the medium of an extrinsic device stch as computer. The frame size and the amount of information given is larger than that of linear programme. The student starts by multiple choice questions designed to test the student's learning of the material. If the student chooses the correct answer, he is told that his answer is right and he is led to the next learning item. If his answer is wrong, he has to go through a discussion where he is told what was wrong with the answer. He is then taken to the original item and allowed to select the right response again.

Branching programmes may be produced for use on a teaching machine or in a book form. The book form is known as a 'scrambled text' because the pages do not follow in a normal sequence. The student is directed to different pages of the book according to the choice of the answer. He is instructed to press a particular button on a teaching machine according to the choice of the answer. The programme is presented on the film which is seen by learner on screen. An error counter records each incorrect answer chosen.

3. Mathematics Programming-The term 'mathematics' has been derived from the Greek math meaning 'to learn'. Thomas F. Gilbert originally formulated the basic concepts of mathematics. As K.P. Pandey puts it, "Mathematics is defined as the systematic application of reinforcement theory to the analysis and construction of complex repertories which represent mastery of subject-matter." The unit for mathematical sequence is called exercise. The size of exercise is determined by the rise of the step a student can reasonably take at the moment. In order to determine the effectiveness of the courses of

instruction, a detailed analysis is made of the behaviour of the student and the responses indicated. In writing mathematical programmes the basic steps are the following–

(i) Data collection and task analysis.

(ii) Prescription for mastery.

(iii) Characterization and lesson plan.

(iv) Exercising writing.

(v) Editing.

2. STEPS IN PREPARATION OF PROGRAMME

K.P. Pandey has listed the following steps in the preparation of a programme for learning-

1. Selection of Units Selection of a unit to be programmed is the first step in preparation of programme. The programme should begin with a small unit as far as possible. The student should not have a tendency to select a very wide and general topic. In a very wide and general topic, he will commit mistakes and meet frustration. Lysaught and William have suggested the following six criteria for the selection of unit to be programmed

(i) ***Programmer's own field of study*** –*The* topic selected for a programme should belong directly to programmer's own field of study.

(ii) **Ease-** *Ease* in the handling of material is another criterion for the selection of a unit to be programmed.

(iii) ***Length*** Another criterion for the selection of a unit is its length. Length of the unit should be determined according to the desired objectives for the subject-matter. Instead of programming a full course in mathematics or grammar it is better to take a unit of the course.

(iv) ***Depressed level of learning*** - Notorious stumbling blocks of learners must be programmed.

(v) ***Logical Order of material*** - Logical order of material is an Important criterion to be followed in the selection of a topic to be programmed.

(vi) *Special student needs* - *Special* students' needs are also an Important criterion in selecting a topic for programme.

2. Writing assumptions about learners - Characteristics of the learners or the audience for whom the programme is being prepared should be written fully and accurately. The programmer should mention assumption about their age, interests, abilities or skills, ambitions and background. The assumotions about learners should be written in objective, concrete nd specific terms. Cumulative records, achievement tests, intelligence tests, aptitude tests, case history and above all personal experiences of the programme as a teacher or learner prove useful in having a complete picture of the learners.

3. Defining Instructional Objectives - Instructional objectives should be defined in behavioural terms. The following points should be kept in mind in this connection

(i) ***Guide for selection of subject-matter and teaching method***- Statement of instructional objectives should provide a guide selecting the subject-matter, the teaching methods and the material to be used during instruction.

(ii) ***Guide for Evaluating Instruments***-Each objective should be stated in terms of student performance rather than teacher performance.

(iii) ***In terms of student's performance***-Each objective should be stated in terms of student performance rather than teacher performance.

(iv) ***In terms of terminal behavior***-Each objective should be stated in terms of learning process rather than learning product.

(v) ***In terms of one general*** *outcome-Teaching* should be so stated that it includes only one general learning outcome rather than a combination of several outcomes.

4. Defining pre-requisite knowledge and skills Pre-requisite knowledge and skills should. be defined in behavioural terms. It helps to draw line of demarcation in respect of elements of the mastery or terminal behaviour which the programmer wants to develop. A careful study of pre- requisite knowledge and skills should be prepared in terms of an empirical study conducted on representative sample of learner for whom the programme is being prepared.

5. Preparing a criterion test - A criterion test shows the entire range of terminal behaviour which has to be developed through the programme. It determines the success or the failure of the programme. While developing a criterion test, the programmer should think very carefully about the situations which will evoke desired behaviour. The whole structure of criterion test should be reviewed by a person expert in the subject-matter as well as in techniques of testing. After this the entire test should be administered on a representative group of subjects. The choice of words, the use of language and relevance of each test item should be properly analyzed. To quote Dr. K.P. Pandey, "A good criterion test is one which reflects representative elements of the universe of behaviour which have been considered as the terminal behaviour." '-

6. Developing contents in the end, specific outline of content to be programmed should be developed. At this stage, the programmer should write the complete information. He should list all the relevant examples, concepts, illustrations, i.e., diagrams, maps, charts etc., which are to be included in the content of a programme. The authencity of the subject-matter should be ensured. The order in which instructional matters is to be presented, should also be decided. Subject-Matter should also be presented according to level and needs of the students.

DYNAMICS OF PROGRAMMING

Programme development is a highly dynamic process. Its making is a very challenging and time consuming exercise which requires mastery on the subject- matter as well as that of various techniques of programming. The programmer must have a scientific inclination to study the nature of behaviour, its various forums and levels. He has to be very skillful and pragnmatic in writing a programme. He puts his decisions in respect of the terminal behaviour and the content structure into an effective form.

STAGE OF PROGRAMME DEVELOPMENT

i) Preparation

ii) Constructing or writing the programme

iii) Evaluation

1) PREPERATION

Peter Pipe suggested the following points before getting down to details-

1. Be prepared to find that preparation accounts for at least 25 percent of your total time.
2. Do not bother to about attaining perfection in one step before you begin the next.
3. Preparation requires hard work for which there is no substitute.
4. One should not reply on memory to keep track of new ideas.

STEPS OF PREPERATION STAGE

1. Selection of a topic (unit) to be programmed.
2. Writing assumptions about learners.
3. Defining objectives in behavioural terms.
4. Defining prerequisite skills in behavioural terms.
5. Writing of criterion test.
6. Developing the content outline.

CONSIDERATION IN SELECTION OF A TOPIC

1. TO BE PROGRAMMED

It should be selected directly from the programmers own field of study. The following yardsticks must be applied in the selection of the unit-

i. Is it something the learner must know?

ii. Is it difficult for him to find a good explanation from other sources? If the answer is in negative, the programmer must select the topic.

iii. The subject matter should be simple

iv. One should select short units which one can use, evaluate and revise in afairly brief period.

v. One should select a unit from a field which is usually considered a stumbling block to the learner. The criterion of case and length should not be ignored.

vi. Arrangements of items should be simplified by keeping in view the logical order of the material.

vii. Special needs of the students should also be taken into consideration.

2. CONSTRUCTING OR WRITING THE PROGRAMME

Stages for the construction of a programme—

1. Planning Stage.
2. Writing Stage.
3. Testing, Revising and Editing Stage.

SPECIFIC SKILLS NEEDED FOR EACH STAGE

1. Planning stage.

(i) Skill in writing behavioural objectives.

(ii) Skill in defining pre-requisite skills.

(iii) Skill in content analysis.

(iv) Skill in preparing a criterion test.

2. Writing stage

(i) Skill in writing frames or modules.

(ii) Skill in differentiating the structural and functional ingredients or frames or modules.

(iii) Skill in using prime and prompts.

(iv) Skill in ordering and arranging frames in a proper sequence.

3. Testing, Revising and Editing Stage

(i) Skills in individual testing which requires establishing a rapport.

(ii) Skill in obtaining evidence about the worthwhileness of the programmes.

iii) Linguistic skill.

(iv) Editing skill.

3. EVALUATION

I. The programmer must list basic assumptions about learners in objective and concrete terms.

2. He should describe the age, gender, skills, interests and ambitions of the learners.

3. He may judge the ability of the learners from scores obtained on intelligence and aptitude test, achievement test etc.

4. He should know the socio-economic status of his learner.

5. He should know the educational level of the parents of the learner.

6. He should be quite frank in writing assumptions about learners.

7. He should not be concerned about its length or its literary style.

COMPUTER ASSISTED INSTRUCTIONS (CAI) MEANING OF CAI

Computer has contributed a lot in each and every sector of life. Computer assisted instruction (CAI) has emerged as an effective and efficient media of instruction in the advanced countries of the world. In fact, CAI is being used in formal and non-formal education at all the levels. In India too, computer has been introduced in most of the areas such as data processing, decision making. It has also an impact on the working methods of research and development in the fields of science and technology. The computers are being used in almost all areas of life i.e., transportation, communication, national defence, scientific research and education.

DEFINITION OF CAI

Hence, the computer assisted or aided instruction may be defined as the use of a computer as an integral part of an instructional system the learner generally engaging in two-way interaction with the computer via terminal.

HISTORY OF CAI

CAI is a natural outgrowth of the application of the principles of programmed instruction or learning. The main objective of programmed instruction is to provide 'individualized instruction just of fulfil the special needs of the individual pupil. In order to achieve this objective, some efficient device is required. This device should be flexible and it can store huge amounts of organized information. The device may enable a person to use some selected part of the stored information. A computer fulfils all these requirements. It can store the organized information; it can process the information suiting to the needs of individual learner. In short, CAI covers the entire educational system by proving itself an useful tool in teaching various subjects.

ORIGIN OF CAI

If we see the origin of a computer, we shall find that some technicians attempted if a machine could programmed to interact with a man. The first commercial computer was operative in 1951 in Census Bureau. First CAI attempt was made around 1961 when the University of Illinosis Produced Programmed Logic for Automatic Teaching Operation (PLATO). Hence, the use of computer in general education started from early sixties.

USE OF CAI

There are two contradictory views regarding the use of computers in general education—

1. CAI provides opportunities for systematically organized maximum learning for all learners. It provides complete individualizing instructions. The increazing amount of information and lack of qualified teachers make the use of CAI very essential.

2. Second view-point is its criticism. The critics see computer as an agent of destruction of human qualities. According to them, no computer can match a person's versatility and the emotional aspect. CAI mechamses human brain. In other words, human beings are converted into machines.

There are many educationists and psychologists who have been trying to find out ways in which electronic information processing may help the teacher in individual instruction. One of the important and prominent approaches is to use computer as a teaching machine. This approach is referred to as computer aided instruction or computer assisted instruction abbreviated as CAI.

Computer aided instruction is a substantial innovation. A computer is a high speed data processing machine. The first large mechanical computer called as an analytical engine was designed during the nineteenth century by Charles Babbage, a

British Mathematician for computing astronomical and mathematical tables. The equipment was not of much success.

During the later part of the nineteenth century, Herman Hollerith developed a machine for processing cards on which information was stored by means of punched holes. This machine was used to speed the tabulation of Census results in U.S.A.

One of the early computers operating on the basis of electric pulses rather than mechanical switching was placed in operation at University of Pennsylvania in 1946. This machine was named as Electronic Numerical Integrator and Computer (ENIAC).

BASIC ASSUMPTIONS OF CAI

1. CAI can be arranged for 4000 students simultaneously. It can cope with the problem of quality and quantity in education.

2. One can learn at his own pace, receives immediate and personalized feedback, i.e., completely individualized instruction.

3. In CAI, each learner's performance during the course and on the test is automatically recorded and can be feedback to the teacher so that he may promptly evaluate the learner's performance and use the data in designing the best teaching strategy for the learner in future.

4. It can be used in all types of teaching-learning programmes. Any lesson in any subject can be programmed for CAI provided that the lesson material can be represented in words, pictures and experiments to be presented to the students.

OPERATIONS IN CAI

CAI system has been, used at all levels of education ranging from elementary school to post-graduate study and on job training in almost all subjects. Atkinson (1968) designed a programme for teaching-reading to infants. The child first must

learn to identify letters. This task of identifying letters is done in three stages of the programme.

1. First stage- A model letter appears on the projector connected with a computer, while three letters are presented on the screen. Then the recorded voice instructs the child to look at the letter on the projector. Differer.t letters are shown on the projector. Training is imparted to the child in identifying the letters.

2. Second Stage - At this stage, the child masters the identification of single letter. During this phase the child learns to discriminate pairs of letters.

3. Third Stage----During this stage, two-three letters combinations are presented on the screen. The child is asked to touch one symbol out of the two combinations which are identical.

A recorded voice asks the child to touch and say the word that would be formed by combining the letters on the side and top of the screen. Errors made by the child can be automatically recorded in the computer. The child thus receives practice. The drills that various learners receive may be entirely different from each other. After mastery of simple reading skills, the child proceeds to acquire successively more complex skills. Computers have been designed to store and retrieve vast amount of information.

INSTRUCTIONAL MODES OF CAI

In the field of instructions, a computer plays a major role. In these computer assisted instructions, it interacts directly with the learners while presenting lessons. The computer delivers instructions directly to students and permits them to interact with the computer through the lessons programmed in the system. There are various instructional modes which can be facilitated by computer assisted instructions (CAI)

1. Tutorial Mode-In tutorial, information is presented in small units followed by a questions. The pupil's response is analyzed by the computer and appropriate feed-back is given. A network of branches or pathways can be programmed to teach. The pupils are allowed to work on their own pace. The more alternative programmes available to the computers, the more adaptive the tutorial can be to individual differences.

2. Drill or Practice n this mode, the programme leads the learner through a series of examples to develop dexterity and fluency in using the skill. All correct responses are reinforced. Only on achieving the mastery by the learner, the computer will proceed further.

3. Discovery mode Here, inductive approach is followed. The problems are presented and the pupil solves those problems through trial and error. It is just like laboratory learning. It aims at the deeper understanding of the results obtained from discovery. Hence, complex problems can be solved.

4. Gaming Mode-This mode may or may not be instructional, but it is recreational. Sometimes learning takes place through games. This mode is especially meant for young children.

5. Simulation Mode-Here, **the** pupil faces scaled down approximation of real life situations. Hence, realistic practice takes place without involving any risk.

6. Problem Solving Mode-Problem solving can be readily achieved provided the typical computational capability of the computer is available and there is a type-writer and display response device with remote control to two-way communication. The students need to know how to communicate with computer and how to solve his problem.

KINDS OF CAI

In computer, linear and branching programmed learning is used. It meets the mid of many students. It functions like a super machine. It interacts with the pupils. The computer keeps the record of each pupil's responses On the basis of these responses, it is further decided which information's. CAI are to be provided to the students. In case of incorrect response, the computer also hints at correct response. In this way, each pupil is cared and feed- back to each and every pupil is provided.

USE OF CAI

i. It is the main sources of receiving facts and information's for the teachers and pupils.

ii. Drill and practice opportunities are provided to the pupils.

iii. It is useful in the form of learning laboratory.

iv. It is important in solving administrative problems.

v. It is helpful in evaluation process.

vi. It is useful in framing time-table.

vii. It is useful in preparing pay-bills.

viii. It is used in developing various skills.

7. **Inquiry Model** – Inquiry is mode of third type of CAI application. In this CAI system responds to student inquiry with answers, it has stored. In this mode instructional staff must learn how the system operates.

8. Author Mode – CAI is used to support instruction by generating sets of materials for a student's use. In generating concept learning materials, these might be sentence forms which have blanks in them each of which is to be filled by a word or a set of words, i.e., inserted into the blanks by computer according to the set of instructions.

9. Logo-This system was developed by Feurzeing and Papart at MIT. Logo is a simple programming language which can be taught to children. This programme provides instructions which can be used to produce pictures on screen. The children who learn LOGO, make up their own programmes to draw flowers or faces or generate designs on the screen.

ADVANTAGES OF CAI

The main advantages of a CAI system are related to the degree to which it permits the individualization of education, particularly instructions.

1. The capability of individualizing both the means and of instruction.

2. The capability of doing research

(i) On teaching under controlled conditions.

(ii) Under conditions which individualize instruction in a particular way.

(iii) On various modes of teaching.

(iv) Ability to collect detailed records of student performance.

(v) Permits evaluation of effectiveness of the teaching procedures as well as teaching materials.

(vi) The capability of developing ways of assisting teachers and authors in the development of instructional materials.

(vii) The capability of evaluating alternative media used to implement and support instruction.

Computer aided instruction (CAI) means using computers to teach people, it does not mean teaching people to use computer or teaching people about computer technology.

Computer can be used in education in two different ways—

(i) To reinforce present educational system.

(ii) To revolutionize the present educational system.(iii) To Jay the foundations for future systems of education to come.

ROLE OF TEACHER IN CAI

It is feared that the use of CAI in teaching-learning will relegate the place of the teacher. To some extent, its use may eliminate teachers from teaching scene. But this fear is false and baseless.

CAI has proved powerful tool for the teacher in the instructional process. Of course, there is some change in teacher's role.

CAI directly interacts with the students individually and with the teacher. Teachers are to play their role in CAL Human teachers cannot be eliminated from teaching-learning process. We can highlight the role of a teacher in CAI in the following manner—

1. Use of New Tools CAI provides the teacher some change to use new tools. This use will enhance the person's satisfaction. Also it will Increase the individual efficiency. rapidly huge amounts ofdata. It can produce elaborate graphs and drawings.

2. Compatible with Like Teaching-CAI is compatible with like teaching. It can be used side by side. CAI is a flexible system ofinstructions. It can very promptly evaluate the performance of individual student. The teacher can devote his time for more creative activities.

EXPERTS NEEDED IN CAI

Computer aided instructions need the help ofthe following experts-

1. Computer Engineer-A computer engineer is a technical person and knows about basic principles and techniques of programming.

2. Lesson Writer-The lesson writer is an expert who is familiar with lesson writing. Lesson writers may be an experienced teachers or an experienced teacher may be a lesson writer. He knows theories of learning.

3. System Operator-He knows the system operation thoroughly and can cope with all commonly occuring failures of software and hardware in the system.

LIMITATIONS OF CAI

1. The computer fails to appreciate the emotions of students. The emotional climate created by teacher in direct class-room interaction with the students is absent in CAI.

2. CAI programmes do not in themselves solve psychological or educational problems. Computer programmes or conventional type do not work like human beings at all.

3. CAI fails to develop essential features language competency where the ability to generate or construct meaningful sentences is essential.

4. It was pointed out that some students got more tired than conventional study or felt like quitting the study.

5. CAI cannot appreciate the student's artistic endeavour and cannot strengthen his friendship and deepen his perception of those around him.

6. The peripheral equipment puts constraints in the ways on which a student can interact with the computer.

COMPUTER MANAGED INSTRUCTIONS (CMI)

In computer managed instructions, the computer gathers, stores and manages information to guide students through individualized learning experience. At the computer is being used in administrative and management, these days, such type of use of a computer is known as computer based learning, for example in disbursing the salaries of the teachers and other employers. Computer is not used directly in teaching-learning process, but is used as an helper in teaching-learning process. If a teacher is made free by assigning his other duties to the computer such as administrative, managemental activities, then he can utilize his spare time in an effective manner in the class-room.

In this way, the main function of the computer is clerical. Generally, the following are the main adm1nistrative and managerial functions of the computer-

1. This can prepare question papers, can evaluate them. Their scores can be analyzed for evaluation or modification purposes.

2. This can collect the examination or evaluation scores.

3. This can help the teachers in preparing time-table.

4. This can help various clerical jobs such as preparing teacher's salaries, completion of their presence records etc.

It is very clear that the computer has become an integral part of our daily routine. Computer literacy is the today's necessity. Hence, it is needed to include the computer education in secondary curriculum. On this purpose, a project class was started in 1984-85. It stands for computer literacy and studies in schools. It was started in 248 selected schools. Then later on, 2522 more schools were included in this project. Under this project, each school was provided with BCACOROY micro-computer systems with other devices. This object has the following objectives.

1. To provide detailed computer knowledge to the pupils.

2. To provide knowledge to the pupils by doing themselves.

3. To provide various experiences of computer education in the various fields of life.

4. To remove various misconceptions regarding computers.

5. To provide knowledge about computer application according to own environment.