CHAPTER II

COMPUTER ASSISTED INSTRUCTION:
A THEORETICAL FRAMEWORK
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CHAPTER II

COMPUTER-ASSISTED INSTRUCTION:
A THEORETICAL FRAME WORK

INTRODUCTION

The problem that plagues every teacher at all levels of education is how to deal a class that contains students who differ in their skills and learning rates. The problem of accommodating student differences is so important that many educators have suggested that instruction to be completely individualised, so that students can work independently at their own rates. Children of today are the future citizens and they are going to be the pillars of the country. Hence, it is essential to ensure that each pillar is as strong as the other. This warrants a special strategy for the learners. Computer based modular approach is such a strategy.

Individualised learning becomes the focus of many researches. Coupled with Skinner's (1954) behavioural psychology, it leads to the development of individualised learning packages. He proposed that learning takes place through a cycle of stimulus, response and reinforcement. It resulted in linear programming and later in branched programme learning. Attempts to design programmed instruction texts and teaching machines have signaled the inadequacy of the simplistic models of learning. A revival of individualised learning has taken place with the advent of computers in education.

A SHORT HISTORY OF COMPUTERS IN EDUCATION

The first use of computers by educational institutions was the introduction of second generation computers at the end of the 1950's. People began to use computers for instructional purpose. One such research was the PLATO project at the University of Illinois (Alpert & Bitzer, 1970), which began in 1960 for designing a large computer-based system for instruction. Soon, IBM introduced course writer for preparing instructional materials on IBMS large computers.
From the mid 1960's through the first half of the 1970's third generation computers became available in increasing numbers at lower cost. In 1972 the MITRE corporation and Brigham Young University started the development of Time Shared System (Merrill, Schneider & Fietcher (1980) with TICCIT. Students studied lessons presented on standard color Televisions and interacted through modified typewriter Keyboards, all of which are controlled by a minicomputer. TICCIT embodied an instructional philosophy called 'Learner Controlled Instruction' in which the students could adapt the sequence of instruction to their own pace and learning style.

In early 1970's, the PLATO project introduced PLATO iv, a large time-shared instructional system. Seymour Papert at the Massachusetts Institute of Technology began research on teaching children by having them program computers (Papert, 1971). Two major developments of Papert's projects are Logo, a powerful but easy learner programming language, and the turtle. Major instructional programs began in the U.S. Navy and U.S. Airforce during 1975. The Ohio State University, the University of Texas, Florida State University, the State University of New York at Stony Brook and a few other Universities also started large computer based instructional projects during this period.

In the mid - 1970's a few small computer companies began experimenting with microcomputers. In 1977, three microcomputers were introduced that proved to be successful. Two large corporations, Radio Shack and Commodore Business Machines introduced the TRS-80 and the PET computer respectively. The introduction of APPLE Computer ushered in the microcomputer revolution. From 1977, till today we see phenomenal growth in educational uses of computers.

**COMPUTER IN THE SCHOOL**

Science and technology are playing a significant role in the formation of modern civilization and in aculturisation of the society. Day by day the increasing scientific and technological impact, upon human-life activities, is developing the scientific attitude of the
individuals in society. And in turn the society has begun to adopt the scientific and
technological principles as well as to apply their results in every field of life with the
intention to achieve a high significance.

In this continuum, a new field has emerged and it is termed as the Educational
Technology. Due to multidimensional development of education technology, its
innovations have made the teacher capable to communicate the knowledge and facts, in the
process of imparting education, to his pupil within shorter time than before. The devices
based on Science and Technology have provided a momentum to the process of educating
the people. Some of these are Tape - recorder, Slides, Film Projector, Television, Video,
CCTV and the Computer. Among these Television, Video and Computer are very novel
devices which present new dimensions on communication technique in imparting the
education. Mechanisation is dominating in today's life. The computer contributes specifically
towards speedy mechanisation.

More emphasis on qualitative - nature of education is being given in changing
socio-economic status of the society. This has even caused to use the computer and other
machines in the field of education. The computer has been accepted as an effective medium
of instruction towards better teaching learning experiences to the growing number of
learners in the society such as ours. A precious and unique machine has been invented in
the form of computer which has got its role even in teaching learning process.
The computers can be used in the field of education in the Schools in many ways.

In Solving the Administrative Problems

Every education institution faced with administrative problems can be dealt with
the computer. In this respect the computer seems to be useful with these advantages.
The problem is solved out at an earliest and to the required extent which could not be easily
tackled by a human-mind. The administrator is saved from suffering mental tension caused through the solving of problem and so keeps himself psychologically more fresh, moderate and energetic. It gives gratification to all concerned.

**Computer in Formal Teaching**

Now the computer has been entrusted upon its role even in the task of teaching in case of the content which appears to a teacher difficult and intricate and he finds himself disinterested in teaching it in the class. But now the computer is used in place of the subject - teacher for performing the task of teaching. It imparts the knowledge in terms of facts and figures and so develops the pupil's understanding leading to adequate learning. This process is termed as learning through computer. Lawrence Stolero and DEnial DEvis (1965) had prepared a teaching model wherein the computer acts in place of a teacher. In this model they propounded that low level objectives pertaining to cognitive domain could be achieved smoothly by employing the computer, Gilligan (1973) has attempted to use the computer successfully in teaching Biology to class XI students. Heartly and others in (1973) used the computer in performing the tasks to which either teachers were disinterested or were considered full of complexity. It was observed that computer completed the task systematically with every success. Sharma and Garge in 1979 reported that school going children learnt mathematics very quickly and logically through computer - instructed learning in comparison to traditional - teaching methodology.

Marlow Ediger (1983) viewed computerized programmed learning as excellent if it is varied with other methods and media in ongoing lessons and units, it is on the understanding level of participating students, it reflects a preferred learning style of students, perceived purpose is involved in learning.
Computer as a Material - Aid

A teacher while on teaching a class, finds a particular piece of content which appears him to be difficult in teaching as well as not to be easily followed by the learners, then the teacher takes the help of Computer - assisted learning. The three situations have been described in the spring issue of Development magazine published by Trent Polytechnique (U.K.) when the computer be used as material aid Memo Erdu, April (1983). When the situation is so complicated that demonstration with hands not feasible, when the significance of the figure / diagram be more specified and the learners have to be assured that nothing has been concealed in the construction of that figure / diagram beyond the pre-structured examples.

Computer in Improving the Standard of Teaching

The computer may be used in analysing and evaluating the standard of teaching in the School. It is also used in analysing and interpreting the examination results from various educational view points. Although the computer was in use of research in various fields of life and now it has been brought into the field of education at research.

At the end a common acronomy in Computer Based Education is being provided. CBE-Computer Based Education, CAI-Computer Assisted/Aided Instruction, CAL-Computer Assisted/Aided Learning, CML-Computer Managed Learning, CBT-Computer Based Training.

IMPLICATIONS TO COMPUTER BASED LEARNING (CBL) DESIGN

Many of the features can be used to make computer based learning environment more effective and attractive. They include feedback, student control, memory and error-cushion effect.
Feedback

In CBL, feedback can be used to motivate and inform students. Feedback with encouraging wording can cheer students up in the learning process and inform them whether their responses to the set tasks are right or wrong. Feedback helps students to locate errors and informs them how to correct them. Feedback should be provided formatively during the tasks sequence to motivate and inform students how well their progress is, and to inform students that they have finished the required tasks satisfactorily or otherwise.

Student Control

In CBL design, the effectiveness of a program can be improved if students are allowed a balance of control over the learning activities and delivery strategies of the program. In terms of activities, they should be so designed to allow self-discovery learning for students to explore relationships between relevant components to infer the rule or to reach conclusions. In terms of delivery strategies, students should be given more autonomy in the way they navigate through the program.

Memory

CBL also demands human memory. Working memory is always the 'bottle neck' that all external and internal information has to pass through when execution of processes and plans is required. To help the student quickly and accurately perform tasks in the learning process the amount of information presented at one time should be limited to that which a person can normally handle. To facilitate knowledge transfer, information and tasks should be presented in successive stages with increasing complexity and difficulty in a linear manner. The linear presentation helps students to progress from a lower level to a higher level of learning and provides different entry points to a program to match students with different abilities.
Error - Effect

The error-effect is important in CBL design if we want to provide an environment in which students can learn without the fear of making errors. To achieve such a framework first, students should be allowed to make repeated passes to a new task without giving up the work they have accomplished. Second, the system should be so structured that under no circumstances would student's previous work be damaged. Third, provide student's with context - based HELP information to tell them where they are in the path that will lead to completion of a task. Fourth, use default options in the system design instead of requiring students complex knowledge of system syntax and procedures for sophisticated outputs.

INSTRUCTIONAL MODES OF COMPUTER - ASSISTED INSTRUCTION

Individualizing instruction that has been receiving a great deal of attention in recent years is computer assisted instruction. This CAI has most exciting innovations in Educational Technology. The decreasing cost and increasing availability of microcomputers in schools have led researchers to become more interested on CAI. Computer - Assisted Instruction (CAI) is becoming an increasingly popular technique for education.

Its marvels have been demonstrated and seem to revolutionize the whole spectrum of education. It has more flexibility and versatility than any of the teaching machines. It can cater to the individual needs of many students at a time and record all the responses of all the pupils with reliability. It helps the education in planning instruction and providing relevant materials.

Computer-assisted instruction has its root in programmed instruction and in the behavioural theories of learning. Based on the theories of learning, learning is accelerated by the use of controlled presentation of stimuli, followed by reinforcement based upon the learner's performance. The CAI can deal the problem of quality in education more effectively. More flexible kind of branching is possible on the part of the computer according to the student's performance. The main instructional modes of CAI are Tutorial, Drill & Practice, Simulation and Instructional Games.
Tutorial

In education, the first use of microcomputers followed the programmed instruction of Skinner, 1954 where, the computer programmed to be patient tutor such that tutorial lessons are given to the students. The computers are used essentially reinforce the concepts which were taught by the teacher in the classroom.

The tutorial and diagnostic systems are designed to 'substitute', 'supplement' some functions traditionally performed by the teacher. Tutorial software presents new material in an interactive mode and may replace lecture or other teacher-led classroom practices. The interactivity of the tutorials provides interest for the student and when properly designed, keeps track of student comprehension and branches to remedial material, should the student fail to grasp the salient concepts offered in the initial presentation.

According to Martin (1990) computer based tutorials, most commonly found for introductory high-school and college topics, free the instructor from the respective task of presenting introductory material to each new class, provide for more flexible scheduling and in some cases, permit an institution to offer courses for which no resident human instructor is available. The teaching material is usually arranged as set of elements which require a response from the learner, although a particular element or sequence of elements may be presented to the pupil as a result of his/her request for advice or information. The response is matched against a set of pre-stored anticipated responses. If the response is matched with the stored one, then the computer selects the next material to be presented to the student. If the response is not matched, the question is repeated again. In some occasions when the performance profile is also built upon the basis of responses, which can be used to decide the route of the individual through the material and the whole class profile can be analysed by the teacher.
Computerized tutorials introduce students to new material. The new concepts are followed by questions that test the students understanding of the material and build toward a certain goal. A careful sequence of questions can lead to discovery and new behaviour. Tutorials are more difficult to write than drill and practice programs because they must teach a skill as well as judge the results. They must predict all possible correct answers and respond meaningfully to incorrect answers by addressing the students specific error, and helping to avoid the error in the future.

A properly designed tutorial can be an excellent teaching device. Material previously presented but not remembered or comprehended can be reviewed. The timings of the presentation of the next concept and its form are based on the results of student responses to tutorial questions (Taber, 1983). The design of a tutorial can be linear or branch. A tutorial that progresses in a linear way presents the same material in the same order to all users, regardless of their individual differences. The branch tutorial, in contrast directs the student to particular lessons based on responses to tests or questions embedded within the material. Branching tutorials may have large sections that are designed linearly.

Tutorial lessons aim to satisfy the information presented and the use of information or skills. Tutorials are almost used in every subject area from the humanities to the social and Physical Sciences. Tutorials are appropriate for presenting factual information, for learning rules and principles and for learning problem solving strategies.

FIG 1. FLOW CHART OF THE TUTORIAL MODE

INTRODUCTORY SECTION ➔ PRESENT INFORMATION ➔ QUESTION RESPONSE

IF WRONG ➔ FEED BACK ➔ CLOSING ➔ JUDGE RESPONSE
The Figure:1 shows the structure and sequence of a tutorial. First tutorial section starts with an introductory section that informs the learner of the purpose and nature of the lesson. A question is asked that the learner must answer. The program judges the response to assess the learners comprehension and next the feedback is given to improve the skill. At the end of information, the program makes sequencing decision to determine what information should be given next. The cycle continues until the lesson is terminated by the learner or the program. Finally is the closing section which contains the summary of the lesson.

All tutorials begin with a short title page to attract the students attention, to create a receptive attitude. A title is essential to inform the students that both a new lesson is about to begin and what it contents are. Gagne and Briggs indicated that doing something is more to motivate the student is more important. Flashy title pages are greeted. Statement of lesson's objectives follows the title page. Mager (1962), Anderson and Faust (1973), encourage the use of behavioural objectives. Some educators like Atkin (1968) discourage the behavioural objectives because they may focus the student's attention on only those things stated in the objectives.

Directions are essential for the effectiveness of computer - based lesson. Directions should be accurate and concise, and should include information about how to answer questions and how to get help. A tutorial should not review prior knowledge in detail, but should provide a synopsis of material. Anderson, (1977); Adams and Bruce, (1980); Rumelhart and Ortony, (1977) stated that Research on human learning has indicated that students will learn more if they can relate new information to what they already know. Pretests in a tutorial should not be used. Pretest should be used only when they are needed and it is used in a separate computer programs.
Presentation

Presentation of information should be short. Text is the most common way to present information in computer-based instruction. Graphic presentation greatly enhances instruction. Sound is necessary when the information itself is of an aural nature. Text should be clear, lean and have good mechanics. Sentences and paragraphs, should be well formatted on the display. Picture and graphic information should be presented simultaneously with corresponding text. Color is effective for attracting and focusing attention. Prompts are used to guide the learners and useful to give hints. Learners should be able to get help when using a computer lesson. A computer program may have a short message at the bottom reminding the learner how to get help.

A program that presents information without the interaction with the learners will not be successful. The main aim of a tutorial lesson must pose questions that the student must answer. Anderson and Biddle, (1975) research supports the facilitative effect of questions in instruction. Questions serve a number of purpose to check the learners attentive to the lesson, to practice and access the information. According to learners' performance, the program decides what information to present next. Questions should occur after each frame and lengthy presentation of questions is avoided. This requires the learner to learn the information presented in each frame.

Questions and Responses

The stem of the question should be a complete sentence. 'Alternate response question' and 'multiple choice questions' are the two basic types. Computer based instruction recommend the use of multiple-choice questions. Multiple-choice questions may use letter keys, number keys or a moving cursor to select the answer. There should be only one correct answer among the alternatives. A single word response is easier to judge the response. In multiple-choice questions, the learners are likely to make errors unrelated to the instructional content.
Reading difficulty should be appropriate to the learners' level. Abbreviations increase the difficulty level of a question. Abbreviations should be defined first time when they are used in a presentation and abbreviations should be avoided in a question. Negative words should be avoided in questions. Scrolling should never occur in a question.

Judging is the process of evaluating a response to give feedback to store data. A judgement is produced by searching learner's response for a correct answer and optionally for an incorrect answer. Single selection answer is the easiest type of judgement. In the single selection answer, the response is judged only when a single word is considered correct. A response must be made within a certain time limit. Main consideration for judging the program is to judge the responses the same way as the teacher would judge them. The questions should be designed such that questions must foster response economy, because it will make judging easier.

Feedback

Feedback is the reaction of a program to the learners' response and may take many forms. Main function of the feedback is to inform the learner about the appropriateness of a response. Feedback should prompt the learner to correct the format and to try again. Feedback with reinforcement must have variety of encouraging words. Reinforcement must not be much time consuming. Negative statements should be avoided and feedback should be positive. Feedback should be corrective to provide the learner with information to improve future performance.

The simplest type of lesson sequence in tutorial is the linear sequence as in programmed learning. Tutorial lesson is of like linear type as in programmed instruction. The lesson progress from one topic or concept to the next, first presenting information and then asking questions. In some tutorials, sequence is affected by the learner's performance and choice. Many tutorials teach a single skill and not have branching from one topic to another.
Tutorials teach information in depth and progress from easier to more difficult problems. Time pause should be avoided. Tutorials that begin with a menu and allow the learner to select a selection to study usually return to the menu after each section is completed. Lahey, (1981) says that differences in sequence do not affect learning, and they suggest that if it makes little difference, the learner should be allowed to control it.

**Sequencing Lesson Segments**

Students should be able to return to previous pages. In simple linear and branching tutorials, this is easily accomplished with a key press. Questions in the tutorial may or may not be repeated when the student returns to previous pages. Tutorials that begin with a menu and allow the student to select a section to study usually return to the menu after each section is completed. The student can then choose another section to study. Lesson sequence based on a menu allows the student not only to review completed sections but also to choose new sections. A tutorial may be ended either temporarily or permanently, when all required parts have been completed. A permanent ending may provide some statement of transition into the lessons that will follow. When a tutorial is about to end permanently, it provides summary statements about the information in the lesson.

Tutorials should provide activities to enhance retention and transfer of learning, according to some educators (Gagne & Briggs, 1979; Gagne, Wager & Rojas, 1981). The retention and transfer are best promoted by instructional methodologies other than tutorials - namely, drill, simulations, games and practice tests.

The factors discussed affect the outward appearance of a lesson and its quality. It provides a basis for reviewing and evaluating instructional programs. It provides a basis for designing a lesson.
Drill & Practice

Drill & Practice exercises are designed to reinforce the regular classroom instruction. They are particularly well suited for use with skill subjects such as math, spelling, some aspects of science subjects. Drill is the necessary part of learning—one that enables students to develop 'automatic recall' (basic facts, word recognition and so on). It is this familiarity with the material that frees students from burdensome efforts and concentrate on concepts and the development of ideas.

Computerized drills is a methodology used for the instructional process. Computer can produce drills of much greater effectiveness than work books. Drills are not intended to teach. Drills are preceded by instructional methodologies that present the information and guide the learner through initial learning.

Drills provide practice and they are applicable to all types of learning. Drills may be applied to simple paired-associate learning, spelling or foreign language, word translation to verbal information such as definitions, historical facts or scientific concepts and principles to simple problem solving such as arithmetic facts and to complex problem solving such as problems in the physical and social sciences.

FIG. 2. FLOW CHART OF THE DRILL & PRACTICE MODE

The Figure:2 illustrates the general procedure of a drill. Like a tutorial, there is an introductory section followed by a cycle that is repeated many times. Each time the cycle repeats and the action takes place. An item is selected, and the item is displayed, the learner
responds, the response will be judged and the learner receives the feedback after the response. This procedure differs from tutorials where there is no presentation of information in a drill, that is replaced by item selection step. Almost drills follow this basic one. Some select items randomly, some in specific order, some terminates the drill after hundred items, some after thirty minutes and some after student performance reaches some level of quality.

The introduction of a drill starts with a short title page. It provides complete directions and allow the learner to return to them at any time. Many drills incorporate methods of initial student control. Drills allow the learner to decide how many items will be presented. In a tutorial, the word 'question' is used, in a drill the word 'item' is used. The term item is referred to all questions in drill. Graphics can enhance drills considerably. In drill, graphics are used to motivate the drill and make it more effective. It has an advantage of reinforcing correct responses with interesting feedback.

In a drill, the items will not be of the same difficulty. Thus from item to item difficulty of responding will tend to vary. The way it varies can be an important factor in the effectiveness of a drill. In the drill, the item selected must have equal difficulty level. The items should start with easy item, and the learner masters them, then the difficult items are presented.

The learners should be given a limited amount of time to respond. Too short a time limit will frustrate the learners. Next is the common method to select items from a list. Most drills such as vocabulary, translation, multiple-choice question, single-word response question and science problem solving select items from a list. All the items presented to the learner are constructed by the programmer and put into a list in the computer permanent storage. The drill program then select items from the list and presents them to the learners. Answer keys are usually stored in the same list.
In drills, the items are selected from a list. Selecting specific items will be based on learners' performance which will improve the drill. The learner after reading each frame will be allowed to answer the question. The learner may answer a question incorrectly, be told the correct answer, but forget it before it is selected and presented again. The fact is that the learner should get more practice on items causing difficulty than on those whose answers are known. When compared to tutorials, drills have permanent termination where the learner has completed the drill and will proceed to another lesson. Permanent termination of drill should be based on learner's performance.

The usual way of dealing with drills is to divide the subject matter into many sub-drills. Drills are recommended to use with a single sub-drill of equal difficulty items. Display and response may also increase learner's motivation. Drill presentations may utilize text, graphics, color or sound. To inform the learners' progress in a drill, the data must be stored permanently or temporarily.

Computer-based drills can be made more interesting through the use of graphics, informing the learners' progress and introducing new variety. The use of interactive graphics increase the effectiveness of drills. Computerized drills provide special feedback for discrimination errors, which require sophisticated response judging and list searching and which is difficult or not possible for other media.

Drills of any sort, with workbooks, flash cards, or a teacher are not very interesting. Computer-based drills can be made more interesting through competition, the use of graphics, informing the student of progress and introducing variety. The use of interactive graphics can increase the effectiveness of drills in the way not possible with workbooks or flash cards. The use of graphics as a prompt, as a context as a motivator and as feedback can all serve to make computerized drills more effective than other types. Computerized drills provide special feedback for discrimination errors which requires sophisticated
response judging and list searching, and which is difficult or impossible for other media. It is very good at storing data of a number of types automatically and effortlessly. This permits permanent records for the student, the teacher and the author about student performance and item quality.

Simulation

"Simulation" means to imitate or pretend to do something. We may simulate imaginary things as well as real things. Edward et al. (1978) define the simulation mode of the computer as one in which the real world is represented by a model which is believed to behave like some position of the real world. Computer simulation is the use of computer to simulate objects or phenomenon and is a powerful tool in industry to test their new products without actually producing them. It may use in research to evaluate the design of new space vehicles, the effect of devaluing the dollar on international economics or the effect of increased birth control education on a country's population.

Simulation is a powerful technique that teaches about some aspect of the world by imitating or replicating. Learners are not only motivated by simulation but also learn by interacting with them in a manner the way they would react in real situation. The main purpose of simulation is to help the learners build a useful mental model of part of the world. Simulations are divided into four main categories as physical, procedural, situational and process. Civil engineers and economists deal with process simulation, educators deal frequently with situational simulations and training professionals with physical or procedural simulations.

The physical science often uses physical simulation to depict experiments. Physical simulations are very common. The purpose of most procedural simulation is to teach a sequence of procedures. The primary characteristic of procedural simulation is that there is a correct sequence of steps that the learner should learn to perform. Situational
simulation deals with the attitudes and behaviour of people in different situations. Process simulation is the one in which they are either accelerated or slowed down by version of the real process.

**FIG. 3 FLOW CHART OF THE SIMULATION MODE**

The Figure: 3 represents the factors in simulation. A scenario is presented. The student is required to react, the student reacts and the system changes in response to this action. Depending upon the nature of the simulation the cycle may repeat frequently.

Simulations have three major parts. They are the introduction, the presentation and interactions and completion of the simulation. The introduction of a simulation starts with a short title page. The objectives of the lesson and the instructional goals are to be specified. A simulation lesson should not only state what will happen in the simulation, but should also make clear the purpose of activity.

**Presentation and Interaction**

The four major types of presentations in simulation are choices to be made, objects to be manipulated, events to react to, systems to investigate choice to be made are usually textual because they involve the selection of one option from among many.

Simulations incorporate more types of input modes than other instructional methodologies. The use of the input devices like mouse, light pens, etc are used in increasing number of simulations. The use of these particular devices is useful in simulation for the
learners to manipulate the objects on the screen. Rigney and Lutz, 1976 say that the use of several modes probably enhances the interest and simulates more learning than by the use of a single mode. Simulation allow a learner to ask for information or to investigate a system, relevant data are usually entered viz. the keyboard.

After taking an action, the learner receives some type of feedback. The advantage of using the feedback is that it has greater results and more interesting and better transfer of learning. Immediate feedback helps to correct the learner before the learner becomes hopelessly lost and confused. A good simulation start the learner with very helpful immediate feedback. Dennis, 1979 describes 'Opening Scene' as a context of the simulation and pays particular attention to the physical entities of the learner which will manipulate the procedures and the learner will engage in the situations, the learner will encounter or the processes to be studied. The main body of simulation contains seven components as content, presentations, student actions, system reactions or feedback, sequence, student control and the completion of the simulation.

First is the context of simulation, a physical entity where the phenomenon is simulated. In the context, colours, graphics and sound can be given for important information in the text. Do not use much detailed graphics and convey the necessary informations, to the text. The sequence of context refers to whether the events occur in a linear or complex fashion. Physical contexts are usually pictorial in nature, situational contents are usually textual in nature, and procedural or process simulations are commonly either or both. The most challenging simulations are those in which both the learner and the context act and react.

The amount of control a learner has in a simulation depends largely on its type. The kinds of control the learner may have are initial choices, returning to remake initial choices, obtaining directions, restarting within the simulation, terminating and restarting after termination.
Completion of the Simulation

Completion means the student has succeeded or failed in a particular run through the simulation. In process simulations this means the process has run to completion and the student may choose to begin it again or not. In physical, procedural and situational simulations, completion usually means the student has followed either a successful path or one that has led to failure. The student may choose to do the simulation, if the student does not choose to do so, the simulation is either temporarily or permanently terminated.

Advantages of Simulation

Simulations have three major advantages when compared to drills and tutorials. They enhance motivation, they have better transfer of learning and they are more efficient. Bruner, 1973 and Papert 1972, 1980 say that the introduction of computers into the educational field is like to make its implementation more widespread although the 'learning by doing' philosophy has long been advocated. Simulations can enhance learning efficiency by providing the learner with an environment that is more conducive to learning than the real one.

Simulations offer other advantages too. Simulation facilitate initial learning. Simulations are powerful learning tools. Simulations encourage active learning and are efficient instructionally. Simulation is one of an instructional methodology that uses full power of computer for instruction.

It is very difficult for a teacher to help students to master the topic through laboratory experiments. So teachers normally use didactic films for presenting the topic. When used in combination with computer simulations it involves students in inspiring activities and it is an effective tool for its graphic facilities and finds greater interactivity among learners.
Simulation is an instructional methodology that uses the full power of the computer for instruction. Simulation improve on tutorials and drills through enhanced motivation, transfer of learning and efficiency. They have the advantages of convenience, safety and controllability over real experiences, are a good precursor to real experiences and are useful for giving learners experiences that would not otherwise be possible.

CONCLUSION

The computer uses in education is directly related to the development of the skills needed for national development. The interactive computer-based instruction changes the human thought structure for children who learn differently with computers when compared to teacher based instruction. The systematically and the potential multidimensionality of the computers as instructive, individualized tutors facilitate the learners learn effectively. However, the teacher being central to any scheme of education cannot be supplemented by the technology. Technology is a tool and a servent within the control of the teacher.