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Unit: I Educational Technology and ICT In this unit, you will learn about, • Introduction • Information Technology ➢ Concept ➢ Meaning ➢ Definition ➢ Characteristics • Concept of Communication Technology • Instructional Technology ➢ Concept ➢ Definition ➢ Nature ➢ Characteristics • Concept of Educational Technology ➢ Meaning ➢ Programmed Learning and Educational Technology ➢ Nature of Educational Technology ➢ Scope of Educational Technology • Information and Communication Technology in Education ➢ Characteristics of ICT In Education ➢ Need of ICT in Education ➢ Advantages of the Use of ICT in Education • Historical Perspectives of Educational Technology • Emerging Trends in Educational Technology • Approaches of Educational Technology • Concept of Communication and Principles ➢ Introduction ➢ Principles of Communication ➢ Barriers to Communication ➢ Verbal and Non-Verbal Communication • Mass media approach in Educational Technology

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Introduction Globalization and technological change processes that have accelerated in tandem over the past

years

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have created a new global economy “Powered by technology, fueled by information and driven by knowledge”. The emergence of this new

global economy has serious implications for the nature and purpose of educational institutions. As you know the 1

half life of information continues to shrink and access to information continues to grow exponentially, schools cannot remain mere venues for the transmission of a prescribed set of information from teacher to student over a fixed period of time. Rather Schools must promote - "Learning to Lear" i.e., the acquisition of knowledge and skills that make possible continuous learning over the lifetime. "The illiterate of the 21st century" according to futurist Alvin Toffler, "Will not be those who cannot read and write, but those who cannot learn, Unlearn & re-learn". Concerns over educational relevance and quality co-exist with the imperative of expending educational opportunities to those made most vulnerable by globalization - developing countries in general, low income groups, girls and women and low skilled workers in particulars. Global changes also put pressure on all groups to constantly acquire and apply new skills. The international Labour organization defines the requirements for education and training in the new global economy simply as a "Basic education for all," "Core work skills for all" and "Lifelong learning for all." In this connection, Information and communication technologies (ICTS) which include radio and television, and the Internet - have been touted as potentially and powerful enabling tools for educational change and reform. When used appropriately, different ICTS are said to help expand access to education, Strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life. However, the effective integration of ICTS into the educational system is a complex, om ultifaceted process that involves not just technology, indeed, given enough initial capital, getting the technology is the easiest part - but also curriculum and pedagogy, Institutional readiness, teacher competencies and long-term financing, among others. Information Technology Concept of Information Technology Today's world is a world of information explosion. This information explosion is taking place in such a fast speed that even a literate person is feeling as if he or she is illiterate being not able to cope up with such an information explosion. Here the question arises how is one to cope up with it? The answer is, information technology (IT) that can help in coping with the information explosion. So, we can say that "Information Technology is nothing but coping up with explosion of Information." Information technology (IT) is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics - based combination of computing and telecommunication. The term in its modern sense first appeared in a 1958 article published in the Harvard Business Review, in which authors Leavitt and whisler commented that "the new technology does not yet have a single established name. We shall call it information technology." It spans a wide variety of areas that include but are not limited to things such as processes, computer software, computer hardware, Programming Languages and data constructs. In short, anything that renders data, information or perceived knowledge in any visual format whatsoever, via any multimedia distribution mechanism, is considered part of the domains space known as Information Technology. 2
Meaning of Information Technology (IT) Information Technology consists of two words Information and Technology. If you know the two words you can understand the word information technology together. The term "Information" refers to "any communication or representation of knowledge such as facts, data or opinions in any medium or for, including textual, numerical, graphic Cartographic, narrative or audiovisual forms." "Technology is the practical form of scientific knowledge or the science of application of knowledge to practical." "Information Technology is any equipment or interconnected system or sub system of equipments that is used in the acquisition, storage manipulation, management transmission or reception of data or information." Definition of Information Technology "Information Technology is a scientific, technological and engineering discipline and management technique used in handing the information, it's application and association with social, economical and cultural matters." "Information technology is a systemic study of artifacts that can be used to give form to facts in order to provide meaning for decision making, and artifacts that can be used for organization, processing, communication and application of information" From the above discussion we can conclude that information technology refers to the information processing of the software application on operating systems or hardware applications that includes computers, videos, telephones and related equipments of telecommunications, tapes, CDs etc. Characteristics of Information Technology Information Technology has the following Characteristics : • Acquisition, Storage, manipulation, management, transmission or reception of data or information. • Real time access to information. • Easy availability of updated data • Connecting Geographically dispersed regions • Wider range of communication media. Concept of Communication Technology Communication Technology is also comprised of two words like "Communication & Technology". We have already discussed that technology is the science of the application of knowledge to practical purposes. You also know that information means any communication or representation of knowledge in any form. Now we will know what communication is? "Communication" is an integral part of human existence. It is communication that decides the very identity of human beings. Modern society is turning into an information society and communication is the exchange of information. It is the process of transferring information form a Sender to a receiver with the use of a medium in which the communication information is understood by both sender and receiver. "Communication Technology" implies the knowledge, skills and understanding needed to exchange information verbally or non-verbally. It is processing of information in 3

terms of accessing information, decoding information and sending it via a medium and changer to the receivers. Medium or channel can be written or oral or gesture form of information through speech, action or any electronic machine. "Communication Technology is the electronic systems used for communication between individuals or groups. It facilitates communication between individuals or groups. Who are not physically present at the same location. Systems such as telephone, telex, Fax, radio, T.V. and Video are included, as well as more recent computer based technologies, including electronic data interchange and e-mail." In short, communication technology is the activity of designing and constructing and maintaining communication systems. Instructional Technology Concept of Instructional Technology There are 2 main characteristics of every technology. They are: • Systematic application of scientific knowledge to the practical tasks and • the division of the practical tasks into sections and Subsections. Any Subject who meets these two norms of the characteristics is called instructional Technology. Instructional technology, today is widely accepted as the application of systems approach in the systemic design of a learning system and as a method or approach combined with the appropriate and necessary media and material to bring about improvement in teaching - learning - evaluation process. Instructional
Technology

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is neither technology in education nor technology of education but both

and all pervasive which pervades the whole teaching

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learning or engineering put it should be taken as a sum total of all such aspects, which go a long way in shaping the personality of the learner in a meaningful context.

Definition of Instructional Technology Instructional technology is just what it sounds lie, using computers, CD Roms, interactive media, modems, satellites, teleconferencing and other technological means to support learning. Instructional technology has several different aspects. It includes the following. • the process of designing instruction. • the application of learning theories and styles to designing instruction • the selection of materials and tools to design and implement a design. • the evaluation of designs. • the effective use of team work and • the use of technology in support of the development and delivery of instruction. According to the Association of

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Educational Communications and Technology (AECT) "Instructional Technology is often refereed to as a part of educational technology but the use of these terms has changed over the years. While instructional Technology covers the processes and systems of learning and

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instruction, educational technology includes other systems used in the process of developing human capabilities". 4 Nature of Instructional Technology •

It's basis

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is science • It studies the effect of science and technology upon education. •

It is a continuous, dynamic, progressive & effect producing method. • It develops new concepts like

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programmed learning, micro teaching, Simulated teaching, video tape, projector and computer etc. • It accepts school as a system. •

It

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cannot solve each an every problem of education. It can be used successfully in teaching and instructional system only. •

It can not replace the teacher Characteristics of Instructional Technology • It is helpful in achieving cognitive objectives. • It can meet the shortage of effective teachers • With it's help, the purpose can learn according to his needs and speed. • It can control the individual differences. • Analysis of contents in depth is carried out in this technology. Concept of Educational Technology Meaning of "Educational Technology" Words are of little interest in themselves but they do indicate changes in thinking. Once the climate of opinion is right, one may arrive at the word "Educational Technology" by different routes. One route starts from audio-visual aids! At first sight, it would appear that teaching machines could go under this heading; but those who work with teaching machines emphasise the importance of programmes rather than machinery. Hence the heading has to become audio-visual aids and programmed instruction, an odd pairing since some forms of programmed instructions use only the printed page. The new term "educational technology" suggests itself and it may be used to refer to a little beyond the use of equipments and techniques that are associated with equipments. On the other route, starting from programmed instruction, a wider conception of educational technology tends to be reached. It is difficult to keep programmed instruction within narrow bounds. Programmed instruction begins to look as though it is a part of something larger and this is educational or instructional technology. Programmed instruction emphasises that the aims of teaching should be analysed, the methods of accomplishing them made explicit and the effects assessed as precisely as possible. These basic ideas are applicable to the systems of instruction that do not necessarily include the use of teaching machines. The term "technology", as Ofiesh (1964) observes, implies the application of science to art. When we apply the science of learning and communication to teaching, we evolve a technology, i.e., the technology of instruction. In modern education, we can witness the impact of two forces; one, of physical sciences and electronics and the other, of behavioural sciences, operating on the process of instruction. Both these forces have contributed to the evolution and growth of educational technology. 5
Figure 1 makes the concept clear. Figure 1: Educational Technology The interaction of behavioural sciences with education has generated a new concept and new technique of programmed learning or automated instruction. Programmed Learning and Educational Technology Educational technology can be regarded, as the application of systematic knowledge about learning and instruction to teaching and training with the aim of improving their quality and efficiency. For this reason, a wide range of presentation, control and feedback devices may be employed such as teaching machines, stimulator and computers. It should, however, be emphasised that techniques such as critical path analysis, curriculum development methods and task analysis are essential components as well as the hardware system. In fact, as long as programmed learning co-ordinates these techniques, it is woven into the fabric of educational technology. The point is that it is not merely a system of presentation, a particular technique or a set of principles; it is a methodology for discovering an efficient means of organising learning situations to attain specified objectives. Looked at from another point of view, the job of the programmer can be regarded as that of providing appropriate opportunities for the pupils to learn. It is his task to discover 6
what these may be and to arrange the environment of learning, as far as he is able to optimise these opportunities. He will, for example, have to determine in some cases whether simulation is as useful as the real thing in some learning situations. Programmed learning, though wide in scope, is only a part of the broader concept of educational technology which must include many areas such as the problem of innovation, resources of learning, standardisation and compatibility of system components, the training of personnel, educational productivity and the design of educational plant. If educational technology possesses any value at all, it is vital that the teachers in training shall be introduced to its philosophy and techniques. In fact, there are two meanings attached to the definition of the term educational

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technology: • One meaning refers to the detailed application of psychology of learning to practical teaching problems. •

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The second meaning refers to the application of engineering principles in the development of electro-mechanical equipments of such devices - pictures, tape- recorders, computers etc. These two meanings of

educational

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technology interact in the design and use of equipment to provide control over the learning situation, a rich array of stimulus materials (e.g., films) and interaction between responses of the learner and the presentation of instructional material.

However, the correct meaning of the term "educational technology" has been differentiated by Lumsdaine by using two different symbols: ET-1, ET-2. 'ET-1' refers to the application of technology to instrumentation useful to the process of teaching. This meaning in its essence is a hardware approach. It stresses the need to develop and use audio-visual aids for teaching. Due to this concept, the process of leaching is mechanised through production and use of teaching aids. ET-2 means the application of scientific principles to instruction and hence the emphasis is on objectives and performances. It is the software aspect. All programmed learning materials and teaching machines come under this.

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Educational technology is thus the application of scientific knowledge about learning and conditions of learning to improve the effectiveness of teaching and

learning.
Nature of Educational Technology
So far no one is universally agreed upon the definition of the term "educational technology." For most people the term brings to mind such electronic gadgetry as film projectors, tape recorders, television sets and micro-computers used as teaching tools. Other people add such non-electrical instructional materials as books, photographs and charts. Still others subscribe to a definition that includes not only items used in teaching but also equipments used in educational administration - keeping students' records on the micro film, communicating between schools by radio, correcting entrance examination papers with the aid of a computer and the like. In effect, educational technology can mean different things to different people. Even those who have specialised in this field have failed to arrive at a proper definition. However, in an attempt to satisfy everyone, the Association for Educational Communications and 7 Technology in the United States have come to the following definition: "

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Educational technology is a complex integrated process involving people, procedures, ideas, devices and organisation for analysing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of learning."

Extensive use of educational technology requires a left of change on the part of the teacher. This is because some technologies are not accepted or only partly accepted because they require too many adjustments of traditional methods of instruction or administration. Frequently, teachers avoid attempting a new instructional technique because it requires too much from them in energy, time, patience or skill to become adept in its Use. Altering old leaching habits in order to master new ones entails not only the expenditure of energy but also the risk of a teacher looking foolish by committing embarrassing errors when attempting new techniques in the classroom. In addition, teachers who have traditionally perceived themselves as classroom's chief performers - lecturing, conducting recitations, leading class discussion - can feel demoted to a less prestigious educational role when they are asked to have reading materials, radio, television or computers to deliver the content of lessons. Thus the amount of change required in the existing habits and the fear of failure or of decreased prestige can affect the teachers' willingness to accept a new technology. Electronic equipment may frighten teachers with its apparent complexity. At least a part of this fear comes from the expectation that something may go wrong during the lesson, making the teacher appear inept or unable to control the teaching situation. To utilise educational television (ETV), many teachers think that much training equipment and general revaluation of teaching goals and activities would be required. However, such fears are baseless. The evolution of technology has in fact ushered in a kind of revolution in our occupational, social and educational world. But it seems a little awkward to observe that whereas the contribution of some kind of technology is visibly felt in respect of the operation of our hospitals, factories, farms and offices, our classrooms have remained a unique example of backwardness by remaining insensitive to the technological inputs and their influences. The reasons for this are not far to seek. Our teacher and via him/her the processes of educational resource generation have not properly assimilated or understood the importance and relevance of technology for the classroom. Also the overall ecology of the formal educational system is responsible to a considerable extent for this state of affairs. Earlier educators used to advocate the use of audio-visual aids in the process of teaching in addition to supplementary aids such as pictures, charts, maps, models and various audio-aids. Gradually, the emphasis shifted to the employment of costly gadgets such as video and computers and now the multi-media approach. In brief, it may then be said that the entire principle of educational technology lies in the : (1) Use of a broad range of resources; (2) Emphasis on individualised learning; and (3) Emphasis on systems approach to education. Scope of Educational Technology By taking into consideration the usefulness of educational technology in all branches of education, one dare not deny the vastness of its scope. It modifies the learner's environment through the various techniques of presentation, arrangement of learning activities and organisation of physical surroundings. 8
The very purpose of educational technology is to facilitate and improve the quality of human learning. It is concerned with achieving the goals - of maintaining internal discipline, adapting to its environment etc. For solving the varied problems of education

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successfully, educational technology consisting of various media of mass communication,

suitable child learning processes, and modern testing and evaluation techniques are essential. Especially in developing countries like India, it has to be mastered and utilised by educationalists if they are to keep pace with each other and catch up with the developed nations. As such both quantitative expansion and

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qualitative improvement of education can be facilitated and accelerated with the help of educational technology.

Today, technology of education is being developed with the aim not only of making education more widely available, but also of improving the quality of education which is already available. Educational technology is conceptualised audio-visual aids. What can it achieve most? Only to improve the quality of message and if it is taken in the form of problem-oriented technique, then its main concern will be the production of teaching-learning material. But both these meanings make the scope limited because educational technology is also concerned with the management and organisation of man and material both, so that they achieve the specific objectives of planning and implementation. Educational technology is concerned with providing appropriately designed learning situations, which hold in view the objectives of teaching. It modifies the learner's environment through the varied techniques of presentation, arrangement of learning activities and organisation of social and physical surroundings. The purpose of educational technology is to improve the quality of human learning. The uniqueness of educational technology is characterised as: (1) Use of a broad range of resources for learning; (2) Emphasis on individualised learning; and (3) Use of systems approach. The effectiveness of educational technology depends on: (a) Ability to achieve goals; (b) To maintain itself internally; and (c) To adapt to its environment. Educational technology is concerned with the disciplined and systematic approach to education and training. It is a sort of investment in national development. Employment structures can be neatly geared to make the best need of development. The entire educational system is educational technology adapting itself to the changing environmental conditions. Thus the scope of educational technology has become very vast. Technology includes: (1) Preparing pupils for learning experience; (2) Reinforcing their values while pupils are sharing the experience; (3) Relating the experience with the lesson and thus stimulating further learning. However, the factors responsible for the progress of educational technology also cannot be overlooked. The factors causing the progress of educational technology are: (1) Student flood due to population explosion; 9
(2) Acute resource scarcities; (3) Rising costs; (4) Unsuilability of output. Hence there must be a focus on relationships of things between the various levels and internal working parts between the educational system and the environment. There is a heavy stress on innovation to achieve the needed improvements and adjustments. This requires modernisation in educational management, modernisation of teachers, of learning processes, strengthening of educational finance and emphasis on non-formal education. If educational technology will not cater to individualised learning, then there will be no individual development and social progress. Information and Communication Technology In Education "Globalization and technological changes

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have created a new global economy powered by technology, fueled by information and driven by knowledge." The emergence of this new

global economy has serious implications for the nature and purpose of educational institutions. As the access to information continues to grow rapidly, schools cannot be contented with the limited knowledge to be transmitted in a fixed period of time. They have to become compatible to the ever expanding knowledge and also be equipped with the technology to deal with this knowledge. Information and communication technologies (ICTs) - which include radio and television, as well as newer digital technologies such as computers and the Internet - have been proven as potentially powerful tools for educational change and reform. When used appropriately, different ICTs can help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by helping make teaching and learning into an active process connected to real life. Definitions "ICT

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stand for information and communication technologies and is defined, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." "

ICT implies the technology which consists of electronic devices and associated human interactive materials that enable the user to employ them for a wide range of teaching – learning processes in addition to personal use."

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These technologies include computers, the Internet, broadcasting technologies (radio and television), and

telephony. "ICT is that technology which uses the information to meet human need or purposes including processing and exchanging." "Information and communications technology (ICT) in education is the processing of information and its

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communications facilities and features that variously support teaching, learning and a range of activities in education."

All these definitions combine Communication technology and Information technology that have thin line between them but cannot do away without each other. When these technologies are applied in the field of education, it is termed as ICT in education. The term too can be used as the connotation to the term Educational; technology because it also uses any hardware and 10
software approaches that can enhance yield better learning outcomes. In the era of Computer technology the term ICT mainly focuses on the infrastructure, devices and sources of computer technology and thus it is imperative to discuss about the use of ICT in education by focusing mainly on Computer based technology. Characteristics of ICT In Education ICT in education is any hardware and software technology that contribute in the educational information processing. In the context of present era, ICT mainly comprises of Computer technology with its hardware, like, Personal computer machine, infrastructure required for setting up Internet facility and also software like, CD ROM including various programme packages, E- learning strategies etc. ICT in education is any Information Technology that focuses on the acquisition, storage, manipulation, management, transmission or reception of data required for the educational purpose. For example, the information about students' records, their admissions, updates of their auricular and co-curricular activities. ICT in education is any technology that deals with the exchange of information or in other' words communication in the teaching learning process. Uses of Electronic learning technology like, Teleconferencing, power point presentations, CD ROM are Communication Technology which is the part of ICT. ICT in education is any educational technology that is applied in the educational process. It encompasses hardware approach like use of machines and materials, Software approach like use of methodologies and strategies of teaching learning and Systems approach that uses the management technology that deals with the systematic organization of the hardware and the software. Different software packages for the use in different department of education; e.g. library software, administration software, software related to managing the entire teaching learning process. ICT in education is the support material in the hands of the human resource involved in the educational process in order to enhance the quality of education. ICT in education comprises of the application of science of On-line, Offline leaming with the help of the computer technology. Need of ICT in Education • Education as a lifelong process therefore any time and anywhere access to ICT

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is the need. • Information explosion is an ever increasing phenomena therefore there is requirement to get access

the

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information. • Education should meet the needs of variety of learners and teachers; therefore ICT is important in meeting this need. •

ICT

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is requirement of the society that the individuals should possess technological literacy. • We need to increase access and bring down the cost of education to meet the challenges of illiteracy and poverty -ICT is the answer

Uses in Education ICT is being utilized in every part of life. Due to the increasing importance of the computer, students- the future citizens cannot afford to keep themselves aloof from this potential 11

medium. In education, use of ICT has become imperative to improve the efficiency and effectiveness at all levels and in both formal and non- formal settings. Education even at school stage has to provide computer instruction. Profound technical knowledge and positive attitude towards this technology are the essential prerequisites for the successful citizens of the coming decades. It can be used for the following purposes: • To broadcast material, online facility or CD-ROM can be used as sources of information in different subjects; • To facilitate communication for pupils with special needs; To use

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electronic toys to develop spatial awareness and psycho-motor control; • To

use the Online resource like, email, Chat, discussion forum to support collaborative writing and sharing of information. • To facilitate video-conferencing or other form of Tele- conferencing to involve wide range of students from distant Geographic areas. • For Blended learning by combining conventional classroom learning with E-leaming learning systems • To process administrative and assessment data. • To exchange and share ideas -among teachers for the professional growth. • To carry out internet-based research to enhance , educational process Advantages of the Use of ICT in Education ICT encompasses all those gadgets that deal with the processing of information for better and effective communication. In education, communication process takes place between teachers, students, management and administrative personnel which requires plenty of data to be stored for retrieval as and when required, to be disseminated or transmitted in the desired format. The hardware and software like OHP, Television, Radio, Computers and related software are used in the educational process. However ICT today is mostly focused on the use of Computer technology for processing the data. In this context, advantages of ICT in education can be listed down as follows : 1) Quick access to information: Information can be accessed in seconds by connecting to the internet and surfing through Web pages. 2) Easy availability of updated data: Sitting at home or at any comfortable place the desired information can be accessed easily. This helps the students to learn the updated content. Teachers too can keep themselves abreast of the latest teaching learning strategies and related technologies. 3) Connecting Geographically dispersed regions: With the advancement of ICT, education does not remain restricted within four walls of the educational institutions. Students from different parts of the world can learn together by using online, offline resources. This would result in the enriching learning experience. Such collaborative learning can result in developing... 12
• divergent thinking ability in students, • Global perspectives • respect for varied nature of human life and acculturation. • Facilitation of learning ICT has contributed in shifting the focus on learning than teaching. ICT helps students to explore knowledge to learn the content through self study. Teacher can help the students by ensuring the right direction towards effective learning. Situational learning, Programmed learning, many Online learning courses are some of the example of self learning strategies that are being utilized with the help of ICT. 4) Catering to the Individual differences: ICT can contribute in catering to individual needs of the students as per their capabilities and interest. Crowded class rooms have always been a challenge for the teacher to consider the needs of every student in the class. 5) Wider range of communication media: With the advent of ICT, different means of communication are being introduced in the teaching learning process. Offline learning, on line learning, blended learning are some of the resources that can be used in educational institutions. Collaborative learning, individualized learning strategies can enhance the quality of group as well as individual learning. with the real society. This can ensure the applicability of knowledge. 6) Wider learning opportunities for pupils Application of latest ICT in education has provided many options to the learners to opt for the course of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can evaluate their own progress through different quizzes, ready to use Online tests. This can ensure fulfilment of the employment required in the job market thus minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs. Historical Perspective of Educational Technology We may study the development of educational technology in three different groups of events as follows: I. 14th Century. Instruction was restricted to mouth

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at the initial stage and then to manuscript. It is not that the teachers of this period failed to notice the importance of individual differences or motivation. But they put more emphasis on manuscript.

In

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the 15th century the art of printing was developed. Books were printed.

However, they were mostly on topics of

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religion and grammar. In the 16th century, Peter Ramus introduced text-books in higher education.

II. 17th Century. In the second group, we peep into the 17th century and here we see

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John Comenius introducing text-books for children. He produced an illustrated book in 1657 – 13 "Orbus Pictures." He wrote about a hundred text-books. But the circulation was very much limited. J. Rosseau, H. Spencer, Froebel, Pesstallozi etc. helped in changing the concept of instruction and pupils. The child was put into the centre. Next came J. Dewey. He tried to introduce the scientific method in education.

E. Thorndike conducted experiments and put forward the learning theories. Then

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came John Adam's concrete-abstract continuum, i.e, define the object - show a model - diagram and then come to the verbal description III. 20th Century, in this century, we, had other sciences like sound recording, photography etc. being developed and these added to the process of learning and teaching. Even electronic transmission was advancing. And all these aided the development of educational technology.

In this third group, we enter into the period of First and Second World Wars.

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During the First World War, the testing movement started. Binet was the forefather of this movement. During the Second World War,

we could see the application of behavioural sciences to teaching and learning. In between, by 1925 Sidney L. experimented with programmed instruction.

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During 1938 and 1940, the concept of visual aids helped the process of learning. It thus paved the way for audio-visual education. In 1954

we got Edgar Dale's "Cone of Experience." Also

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during the same period, Weiner studied human engineering and also worked on the science of cybernetics. By 1950, the

world had also got

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Instructional Theories by Bruno, Glasser etc. In 1953, Gordan Pask applied the principles of cybernetics to education.

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In 1970, different developments took place and the concept of Educational Technology took its shape more neatly.

Pioneering work in CAI (Computerised Applied Instruction) was carried out by Pask. Development of communication, system-approach, social psychology (inter-group relationship), human factor approach to behavioural science - all these contributed to the development of educational technology. So also the audio-visual movements contributed to the development of education technology. By this,, it is clear how the things in the field of education changed their original shapes and formed into an altogether new one. But the question that now arose was: "Is audio-visual education different from the principles of educational technology?" The answer to this is as given below. Audio-visual Aids 1. Audio-visual aids only try to improve the quality of the . message. 2. Audio-visual aids ignore the individual differences. 3. Audio-visual aids do not take into consideration the enrichment of other fields. 4. Audio-visual aids are only materials Educational Technology • Educational technology concentrates on the psychological principles. • Educational technology emphasizes on individual differences. • Educational technology takes into consideration the development of social anthropology. • Educational technology is definitely a technique. While thus going through the history of educational technology, it is also essential to note certain important events that helped for the development of educational technology. The 14
Government of India sent a proposal to establish a centre for curriculum and media development under the United Nations Development and Programme Scheme (UNDP) and this proposal was approved in 1970 by Wilber Schramm. It was, therefore, felt by the Indian educationists to have a Centre for Educational Technology at Delhi and accordingly it was established at NCERT. Then in 1973, another unit for educational technology in the Ministry of Education was also established. After this the Government of India wanted educational technology cells to be established in different states. Today, we have educational technology cells in thirteen different states, among them being, Maharashtra, Gujarat, Orissa, Madhya Pradesh, Andhra Pradesh, Karnataka, Uttar Pradesh, Rajasthan and Tamil Nadu. Educational Technology cells have also been started at all the four Regional Colleges of Education, that is, at Bhopal, Ajmer, Mysore and Bhubaneswar. Emerging Trends in Educational Technology The two major trends that have developed in the process of educational technology are: (1) technology for mass instruction and (ii) technology for individual instruction. Included in the first type are instructional broadcasting, television filmed lectures, CCTV, motion pictures etc. Under technology for individual instruction, there are equipments and materials designed for individual operation such as teaching machines, programmed instruction, auto-tutorial system, computer-assisted instruction, language laboratories, learning modules etc. Programmed Instruction In a fast developing world, the teacher cannot and ought not to be left alone to depend upon his own resources and talents to disseminate knowledge to the pupils. The classroom teacher should be supplied with reliable instructional material based upon the dependable findings of educational technology. This will help him to do his job with maximum perfection. Programmed learning is one such big step in this direction. In this the subject-matter or content of the course displays a few distinct characteristics such as: Jubilation Qnal Technology – Its Nature and Scope i. a clear-cut statement of the objectives; ii. the material to be learned is itemised and presented serially; iii. frequent and unambiguous responses from every student are required throughout the whole sequence. Unless the learner makes some responses which are relevant to the learning task, no learning will occur; iv. feedback of information about the correctness or otherwise of the responses is given to the pupil before the next frame or item is presented. Modular Scheduling A module is a short unit of instruction dealing with a single conceptual unit of subject matter. Each course is built in the "bank" of a number of modules and each module is designed around a list of objectives and student projects. A variety of learning activities centred around the learner and incorporating a multi-media approach is provided. The components of modules include modular lecture unit, laboratory unit, programmed instruction unit, workshop unit, individual study unit, film unit, audio-tape unit, video-tape unit etc. 15

Multi-media Approach For effective and efficient learning, it is now accepted that there should be a multi-media approach. Edgar Dale (1969) through his "Cone of Experience" has demonstrated that in any learning situation, the more the senses are stimulated, the more the person learns and the longer he retains. Dale describes how the different types of aids, starting from verbal symbols up to direct purposeful experiences, are interrelated and effective in the learning process. The different materials of the experiences presented in the cone may be classified into three: (i) non-projected aids; (ii) projected aids; and (iii) activity aids. The following are some specific applications of instructional technology in imparting formal education: 1. Use films, television, slide-tape presentation and so forth as an alternative to a lecture for presentation of information. 2. Buy, borrow or produce 2" x 2" colour slides, showing the steps in a process to be demonstrated. 3. Use an opaque projection to show a printed diagramme. 4. Make a transparency from a cartoon or drawing in a few seconds on a thermographic copier and show it to the class using an overhead projector (OHP). 5. Draw chalkboard diagrams once on transparency masters; then project the transparencies made from these masters on OHP, thus saving the time wasted in re- wording them each year. Record questions, problems, exercises and background information on different subject or at different levels of difficulty on tape for use by individuals or small groups with cassette play back units. While some students are interacting with the recorded material, you will to free to work intensively with the others. Approaches
of

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Educational Technology The scientific investigations of technological developments have influenced every walk of human life.

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The educational process does not remain untouched by these advances.

There is rapid mechanization in field of education.

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It has resulted the introduction of technology in field of education. Many different approaches of technology

can be used to support and enhance learning.

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Various approaches of Educational technology deliver different kinds of content and serve different purposes in the classroom. Each approach of technology

is likely to play a different role in students' learning. There are several educational approaches in technologies and there is great overlap among them.

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The educational process does not remain untouched by these advances. It has necessitated introduction of

these approaches in technology in the field of education. There are three different types of approaches (1) Hardware Approach (2) Software Approach (3) System Approach (1)
Hardware Approach of Educational Technology 16

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The hardware approach refers to the use of machines and other mechanical devices in the process of education. Its origin lies in the application of "physical science" to education and training system. The process of teaching-learning has been gradually mechanized through the use of teaching machines, radio, television, tape recorder, video-tape, projectors etc. The teacher can deal with a larger group of students at the same time by his discourse through these machines. The hardware approach is based on the application of engineering principles for developing elector-mechanical equipment for instructional purposes. Motion pictures, tape recorders, television, teaching machines, computers are called educational hardware. Hardware approach mechanises the process of teaching so that teachers would be able to deal with more students with less expenditures in educating them. Human knowledge has three aspects: • Preservation, • Transmission

and •
Development

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The history of preservation of the knowledge is believed to exist since the printing machines started. The knowledge is preserved with these machines in the form of books which are shelved in the libraries,

tape recorders and films.

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The second aspect of human knowledge is its transmission. A teacher can impart knowledge himself to his pupils. Now a days, transmission of the knowledge is supported by machine like mike, radio and television. With these, thousands of pupils can enjoy this home- delivery of such benefits. The third aspect of human knowledge is its development. For this aspect, provisions are made for research work. In the research programmes, the main function is the collection and analysis of data. For this purpose, presently the researcher uses the electronic machines and computers. Hence, all the three aspects of knowledge allow the use of machines. In short, the teaching process has been mechanized. The mechanization of teaching process is termed as the Hardware Approach. Basis of Hardware Approach • Hardware Approach has physical science and applied engineering as its basis. • Hardware Approach has mechanised the whole teaching-learning process. • Hardware Approach adopts a Product-oriented Approach. • Hardware Approach has the potential to hand over the educational benefits to the mass with greater ease and economy. Characteristics of Hardware Approach • Silverman, called this type of educational technology 'Relative Technology'. Based on physical science and applied engineering field approach. The concept of hardware approach is derived from the application of "physical science" toeducation. • The new mechanism of teaching-learning with improved technology as its basis. Suggesting innumerable new ways of doing things to the class-room teachers 17 • The job and the duties of the teacher are likely to have multifaceted changes as they are to deal with many new gadgets for teaching and learning . • Engineering principles are used for the development of these types of technical equipments. The teacher can deal with larger group of students with the help of these 'Mechanical device' or 'Machines'. • The teacher can deal with larger group of students with the help of these 'Mechanical device' or 'Machines', resulting in less cost and economy in

finances . (2) Software Approach of Educational Technology

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The pioneering work in software approach was done by Skinner and other behaviourists. The programmes which such a technology produces are often called software. Software Approach is also termed as Instructional Technology or Teaching Technology or Behavioural Technology. It originates from behavioural sciences and their applied aspects concerning psychology of learning. The software approach used the principles of psychology for building in the learners a complex repertory of knowledge or modifying his behaviour . Psychology of learning provides solid technology for bringing desirable behavioural changes in the pupils and serves the cause of education of laying down definite instructional procedure, teaching behaviour and behaviour modification devices. Newspapers, books, magazines, educational games, flash cards may also form part of software. Software approach is characterised by task analysis, writing precise objectives, selection of appropriate learning strategies, immediate reinforcement of responses and constant evaluation. Software approach refers to the application of teaching- learning principles to the direct & deliberate shaping of behavior. Its origin lies in the application of "behavior science" to the problems of learning & motivation. Educational technology is closely associated with the modern principles & theories of teaching. Models of teaching, theory of instruction, theory of teacher- behavior & principles of programmed learning. It is characterized by task analysis, writing, objectives inbehavioral terms, selection of the appropriate teaching strategies, reinforcement for correct responses & continuous evaluation. Software Approach is concerned with teaching objectives in behavioural terms, principles of teaching, methods of teaching, reinforcement of instructional system, feedback, reviews and evaluation. Software approach tries to develop all the three basic components of technology, i.e. Input, Process and Output. Basis of Software Approach In software approach, the basis of all thinking and working is behavioural science and psychology of learning. Software approach uses the principles of psychology for the purpose of behaviour modification. A teacher with added knowledge of software approach can use the films, flashcards, tapes etc., for various purposes. A teacher can plan better teaching which results into better learning. There is not end to his thinking. 18 Characteristics of Software Approach This view of educational technology is closely associated with the modern principles of programmed learning and is characterised by task analysis, writing precise objectives, selection of appropriate learning strategies, reinforcement of correct responses and constant education. Silverman termed this educational technology as 'constructive educational technology.' Also known as 'Management Technology'. A modern approach in educational administration and organisation. It has brought to educational management a scientific approach for solving educational administrative problems. Origin of software approach lies in the application of 'behavioural science' to the education. It refers to the application of teaching- learning principles in the shaping of behaviour. Its application while writing objectives in behavioral terms, selection of appropriate teaching, strategies, reinforcement for correct response etc

Software Tools Word processing, database, spreadsheet, telecommunications, presentation, authoring, graphic paint programs. Teachers need to know how to use them, how to teach them tostudents, and how and why to use them in the classroom. Software Types Drill and practice, tutorials or computer-based instruction, and simulations. Teachers need to know what these are as well as why, when, and how to incorporate them into their teaching. Software Review and Evaluation How to select appropriate software for specific grade levels and content areas, how to evaluate the effectiveness of this software, and what types of software are available. Teachers need to be thoroughly familiar with many of the software options available and understand when and how to use them in the classroom.
Comparison of hardware and software Approach S.No.

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Hardware Technology Software Technology 1 Has its origin in physical sciences and applied engineering. Has its origin in behavioural sciences and their applied aspects concerning psychology of learning 2 More concerned with the production and utilization of audio visual aid material and sophisticated instruments and mass media for helping teacher and learners in their task Try to make use of psychology of learning for the production and utilization of software techniques and materials in terms of learning material, teaching-learning strategies and other devices for smoothening the task of teaching learning. 3 Tries to adopt product-oriented approach, in the shape of teaching-learning material and strategy

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Tries to adopt a process-oriented technique or approach for the production of teaching- learning material and strategies. The 19

through their

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utilization of the hardware instruments and gadgets for effective teaching learning. material produced here is made available for being used by the hardware application. 4 Based on the concept of service meaning hereby that it provides services in the field material being used by the

hardware of education.

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It helps in the production of software material being used by the hardware applications and gadgets for delivering their service to the users i.e. teachers and learners. 5 As examples of the appliances and gadgets being used in hardware technology service we can name radio, television, tape recorder, video, slides and film projectors, teaching machines and computer etc. As examples of the material produced through software technology we can name, programmed learning material, in the shape of charts, pictures, models, slides filmstrips, audio and video cassettes, software packages etc. 6 Needs the services of software technology for its use and functioning. It can't go without the aid of software technology e.g. computer hardware in the shape of a machine like device is of no use if it does not make use of software services both for its operation as a machine and its multi-dimensional utilities. The use of application and utility software is in fact must for taking any service from the hardware technology of the computer. Most useful and productive in the case if it is assisted and made into use by the hardware applications and gadgets. However, it can go alone for delivering its services to the users without calling aid from the hardware technology i.e. you can make use of programmed learning material a graph a text, etc. directly for the individualized as well as group instructions. 7 Has its mass appeal and utilization. It can contribute a lot in handing over the educational benefits to masses with greater case and economy. Has no such wide application and appeal to masses as found in the case of hardware appliances like radio, telephone, computer application, etc. 8 Has resulted in improving the efficiency of educational, means and reducing the cost of education. A teacher may handle a big class with the help of hardware appliances like microphone, slide and film projectors etc. Works for increasing the efficiency of the teachers as well as learning. However, it lags behind in the task of improving efficiency and reducing the cost of education. Role of hardware and software technologies in modern educational practices 1. Making the task of teaching-learning interest, purposeful and productive: • Suggesting suitable teaching-learning methods, devices and strategies based on psychology of teaching-learning. 20 • Suggesting suitable maxims and principle of teaching-learning based on the theory and practice of technology of teaching-learning. • Putting various types of audio-visual aid and materials and equipment at the disposal of teachers and learners. • Providing a variety of instructional and self-learning material suiting the varying needs of teaching-learning situations and individuality of the teacher and learners. 2.

Use the multimedia and multi-sensory approach to teaching-learning: • Hardware and software technologies help the teacher as well as the learners for making a proper and judicious use of multimedia and multi-sensory aid material, equipment and principles of teaching-learning, derived from psychology and technology of teaching. • All the sensory organs sense the sight, hearing, touch, smell and taste for the• acquisition of the desired teaching-learning experiences. • Multimedia, material and appliance involving hardware and software technologies for sharing desirable teaching-learning technologies. • All the relevant and needed teaching-learning method, devices, and strategies, well- accompanied and aided by hardware and software technologies. 3. Management of the affairs of educational practices in an efficient and productive way: • Educational and professional responsibilities • Planning of teaching-learning. • Organization of teaching-learning. • Leading teaching-learning. • Controlling teaching-learning. 4. Providing proper input and process for the best possible outcomes (products): In the true spirit of the system engineering, use of hardware and software technologies can help the educational and instruction system to make all possible efforts for providing adequate and the needed process organizations to arrive at the best possible outcomes. 5. Fulfilling the expectation of distances and correspondence education: The demands of today's education and modern education practices are putting increase emphasis on the extension of distance education and correspondence and online education facilities to the increasing number of learners. 6. Individualization of instruction: Individualization of instruction is a major trend in the modern educational practices and is the demand of the hour. In brief, we can highlight the role of hardware and software technologies on this account by stating some of the materials and equipment as follows: • Programmed instruction, programmed books, and programmed learning modules. • Teaching machines, computer assisted instruction and computer managed learning. • Video and audio recorded learning and instructional material. • Email, internet, teleconferencing and other online educational facilities. • Special aid material, equipment and appliances used for special education and adjustment measure of for the disabled. • Special provisions and facilities for the creative and gifted to nature and develop their individual capacities according to their pace and interest. 21

System Approach of Educational
Technology

80% **MATCHING BLOCK 52/77** **W**

System approach is a systematic attempt to coordinate all aspects of a problem towards specific objectives. Webster's dictionary defines a system as "a regularly interacting or independent group of items forming a unified whole." The characteristics of a system of may be explained with the help of an example – various parts of the digestive system may be called as components of digestive system. Every component of the digestive system

contributes to as
supports in functioning of the digestive system

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as a whole. In the context of education, system is a unit as a whole incorporating all its aspects and parts, namely, pupils, teachers, curriculum, content and evaluation of instructional objectives. The teaching-learning process is viewed as communication and control taking place between the components of a system. In this case, the system is composed of a teacher, a student and a programme of instruction, all in a particular pattern of interaction. The System Approach focuses first upon the learner and then course content, learning experiences and effective media and instructional strategies. Such a system incorporates within itself the capability of providing continuous self-correction and improvement. It is concerned with all elements of instruction including media, including hardware and software. Its purpose is to ensure that the components of the organic whole will be available with the proper characteristics at the proper time to contribute to the total system fulfilling the objectives. In the systems approach to instruction, the teacher has to plan completely the utilization of selected resource material and the classroom activities. The teacher should have a good overall view of the subject, know his/her limitations, know all about his/her pupils and the individual differences in their learning capacities and plan accordingly. The system approach involves continuous evaluation of learning outcomes and utilization of knowledge gained by analysis of results of evaluation to suitably modify the plan of approach to achieve the stated objectives. Major steps in the systems approach in education

are: 1.

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Formulating of specific instructional objectives to be achieved and defining instructional goals 2. Deciding appropriate media to achieve these goals 3. Defining learner characteristics and requirements 4. Selecting appropriate methods suitable for effective learning to take place 5. Selecting appropriate learning experiences from available alternatives 6. Selecting appropriate materials and tools required 7. Assigning appropriate personal roles for teachers, students and supporting staff 8. Implementing the programme 9. Evaluating the outcome in terms of original objectives measured in student performance

and 10.

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Revising to improve efficiency of the system to improve students' learning. Advantages of System Approach i. Systems approach helps to identify the suitability of the resource material to achieve the specific goal. 22 ii. Technological advance could be used to provide integration of machines, media and people for attaining the defined goal.

iii.

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It helps to assess the resource needs, their sources and facilities in relation to quantities, time and other factors. iv. It permits an orderly introduction of components demonstrated to be required for systems success in terms of student learning. v. It avoids rigidity in plan of action as continuous evaluation affords desired beneficial changes to be made. Limitations of System Approach i. Resistance to change. Old ways are difficult to erase. There is always resistance to any new method or approach. ii. Involves hard work. Systems approach requires hard and continuous work on the part of school personnel. Some are not prepared for the extra load. iii. Lack of understanding. Teachers and administrators are still not familiar with systems approach. Though it has been successfully implemented industry, it has still to make headway in education.

Concept of

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Communication and Principles Introduction Communication plays an effective and essential role for running the show

for any formal and

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informal teaching- learning process. In many ways, teaching is communicating and in this sense good teachers are always good communicators. It is also equally true for the learners. He who learns well is the one who participates well in the communication process. Good learners are always good receivers and responders. In this way, communication as a vehicle or tool for running the show of teaching - learning act, must always be treated as a two way process in which both the source(teacher) and the beneficiary(learner) of teaching interact well for the proper realization of the teaching-learning objectives.

Concept

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Communication, in its literal sense, stands for the act of communicating. One can communicate his ideas, thoughts, feelings, etc or transfer any type of information and knowledge to others through this act. For this purpose, he may also take the help of some instruments, appliances, or devices like telephone, teleprinter, telegram, radio broadcasting

and

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telecasting. In this sense, communication may be taken as a one - sided transaction of a piece of information, knowledge, ideas, thoughts and feelings from a person to another person or persons at

a receiving end. Fabun (1960) puts it very simply, when he says: "The interactions between the 'happening' that is you, and the 'happenings' that are NOT you, are the raw, basic stuff we try to communicate about." Communication, therefore, can be through words, the way we stand, the tone of our voice, the way we look at another, i.e., any behaviour that we use to express what we are experiencing. There is a message in communication; it may be expressed verbally, non-verbally or through 23
postures or body language. Messages may be verbal, non- verbal or behavioural stimulus. The sender transmits the message to the receiver through a channel (means) like sound waves of the voice, light waves involved in seeing, printed words etc. Principles of Communication Communication as a two-way channel requires certain basic principles to be observed for its effective outcomes. Following principles of communication make it more effective: 1. Principle of Clarity: The idea or message to be communicated should be clearly spelt out. It should be worded in such a way that the receiver understands the same thing which the sender wants to convey. There should be no ambiguity in the message. It should be kept in mind that the words do not speak themselves but the speaker gives them the meaning. A clear message will evoke the same response from the other party. It is also essential that the receiver is conversant with the language, inherent assumptions, and the mechanics of communication. 2. Principle of Attention: In order to make communication effective, the receiver's attention should be drawn towards message. People are different in behaviour, attention, emotions etc. So they may respond differently to the message. Subordinates should act similarly as per the contents of the message. The acts of a superior also draw the attention of subordinates and they may follow what they observe. For example, if a superior is very punctual in coming to the office then subordinates will also develop such habits. It is said that 'actions speak louder than words. 3. Principle of Feedback: The principle of feedback is very important to make the communication effective. There should be a feedback information from the recipient to know whether he has understood the message in the same sense in which the sender has meant it. 4. Principle of Informality: Formal communication is generally used for transmitting messages and other information. Sometimes formal communication may not achieve the desired results, informal communication may prove effective in such situations. Management should use informal communication for assessing the reaction of employees towards various policies. Senior management may informally convey certain decisions to the employees for getting their feedback. So this principle states that informal communication is as important as formal communication. 5. Principle of Consistency: This principle states that communication should always be consistent with the policies, plans, programmes and objectives of the organization and not in conflict with them. If the messages and communications are in conflict with the policies and programmes then there will be 24

confusion in the minds of subordinates and they may not implement them properly. Such a situation will be detrimental to the interests of the organization. 6. Principle of Timeliness: This principle states that communication should be done at proper time so that it helps in implementing plans. Any delay in communication may not serve any purpose rather decisions become of historical importance only. 7. Principle of Adequacy: The information communicated should be adequate and complete in all respects. Inadequate information may delay action and create confusion. Inadequate information also affects efficiency of the receiver. So adequate information is essential for taking proper decisions and making action plans. Barriers to Communication 1) Environmental Barriers: The location where a message is sent can be disrupted by geographic distance, or by interfering factors such as other people or movement (like in a car or on a bus). It can also be blocked by actual loud, audible noise etc. 2) Physiological Barriers: Fatigue, stress, or negative emotions can lead to a breakdown in effective communication. Physical disabilities in either sender or receiver can be a challenging factor as well. 3) Psychological Barriers: Opinions, judgements, prejudices, attitudes and perception all can play a part in the transfer of messages. If a receiver dislikes or mistrusts the sender of a message, the decoding of that message can be skewed – maybe with good reason. The same goes for the sender too. If a sender has strong opinions about the receiver(s), the communication process becomes much more complicated. 4) Systemic Barriers: When I started a new job at a rather large company a while ago, the “company speak” was filled with jargon and acronyms, so many that the company website provided an acronym dictionary so that workers could find out what the heck was being communicated. Sometimes organizational communication can be very challenging and it is important for the leaders of an organization to stay open and aware of occurrences of this nature. 5) Cultures & Beliefs: Different cultures communicate differently. They have differing rules and expectations of behaviours. Eye contact is expected between people here in the US, but it is considered rude in some Asian countries. There are also differing expectations of “personal space” all over the world. A gesture or behaviour that is considered rude would certainly interfere with any kind of message that you are trying to convey. If you are working or travelling in other countries and cultures, it is important for you to “know the rules” of those with whom you are dealing. 25

6) Physical Barriers: Physical barriers in the workplace include: • marked out territories, empires and fiefdoms into which strangers are not allowed • closed office doors, barrier screens, and separate areas for people of different status • large working areas or working in one unit that is physically separate from others. Research shows that one of the most important factors in building cohesive teams is proximity. As long as people still have a personal space that they can call their own, nearness to others aids communication because it helps us get to know one another. 7) Perceptual Barriers: The problem with communicating with others is that we all see the world differently. If we didn't, we would have no need to communicate: something like extrasensory perception would take its place. The following anecdote is a reminder of how our thoughts, assumptions and perceptions shape our own realities. Example: A traveller was walking down a road when he met a man from the next town. "Excuse me," he said. "I am hoping to stay in the next town tonight. Can you tell me what the townspeople are like?" "Well," said the townsman, "how did you find the people in the last town you visited?" "Oh, they were an irascible bunch. Kept to themselves. Took me for a fool. Over- charged me for what I got. Gave me very poor service." "Well, then," said the townsman, "you'll find them pretty much the same here." 8) Emotional Barriers: One of the chief barriers to open and free communications is the emotional barrier. It is comprised mainly of fear, mistrust and suspicion. The roots of our emotional mistrust of others lie in our childhood and infancy when we were taught to be careful what we said to others. Verbal and Non-Verbal Communication 1) Verbal Communication Verbal communication encompasses any form of communication involving words, spoken, written or signed. The conversation we have with our co-worker at lunch, the morning news or the sports page we read in the morning-even the text message you send to your spouse telling him to pick up some milk is a form of verbal communication. Our ability to communicate with a language that is based on an organized system of words, rather than merely sounds, is what sets us apart from lower species. Not only do we have language, but we also have the technology that enables us to communicate with one another no matter the physical distance.

Verbal communication has two types: A. Oral Communication B. Written Communication 26

A) Oral Communication: A communication which happens through word of mouth, spoken words, conversations and also any messages or information are shared or exchanged between one another through speech or word of mouth is called oral communication. Example: Public speech, News reading, Television, Radio, telephone and mobile conversations. B) Written Communication: A communication happens through any word written or often written sign which refers the languages uses in any medium is called written communication. Example: Simply any hand written, typed, Newspaper, printed word documents, letters, books and magazines.

Why is Verbal Communication Important? We use verbal communication to inform, whether it is to inform others of our needs or to impart knowledge. Clarification is a key component of verbal communication. Often, we do not articulate ourselves clearly, or our words or actions are misconstrued. Verbal communication helps to clarify misunderstandings and provides missing information. We can use verbal communication to correct a wrong. The power of the words, "I'm sorry," is often more effective than an action. Verbal communication can also be used as a tool of persuasion. It creates an opportunity for debate, stimulates thought and creativity, and deepens and creates new relationships. Robert M. Krauss in the article, "The Psychology of Verbal Communication," published in the International Encyclopedia of the Social and Behavioral Sciences in 2002, explains, "A species' survival depends critically upon its ability to communicate effectively, and the quality of its social life is determined in large measure by how and what it can communicate." Non-Verbal Communication Verbal communication coexists alongside non-verbal communication, which can affect people's perceptions and exchanges in subtle but significant ways. Non-verbal communication includes body language, such as gestures, facial expressions, eye contact and posture. Touch is a non-verbal communication that not only indicates a person's feelings or level of comfort, but illustrates personality characteristics as well. A firm handshake or warm hug indicates something very different than a loose pat on the back or a timid handshake does. The sound of our voice, including pitch, tone and volume are also forms of non-verbal communication. The meaning behind someone's words is often entirely different than the literal translation, as is seen in instances of sarcasm and mockery. The clothing we wear and the way we design our living space are also forms of non-verbal communication that frequently shape people's judgments about others, regardless of whether or not the perceptions are true. Why is Non-Verbal Communication Important? Think of how many relationships start with a man and woman making eye contact across a crowded room. A playful wink tends to be more effective than a well-thought out pick-up-line. Michael Argyle, in his book "Bodily Communication," identifies five main functions of non- verbal communication: to express emotions, communicate interpersonal relationships, support verbal interaction, reflect personality and perform rituals, such as greetings and goodbyes. Edward G. Wertheim, Ph.D., in his paper, "The Importance of Effective Communication," details how non-verbal communication interacts with verbal communication. We can reinforce, contradict, substitute, complement or emphasize our verbal communication with no- 27
verbal cues such as gestures, expressions and vocal inflection. Avoiding eye contact when we tell someone we love them communicates something far different than do spoken words, just as a bright smile when we say congratulations reinforces the sincerity of our words. Types of Non- Verbal communication and Body Language There are many different types of non-verbal communication. Together, the following non- verbal signals and cues communicate your interest and investment in others. 1) Facial Expressions: The human face is extremely expressive, able to express countless emotions without saying a word. And unlike some forms of non-verbal communication, facial expressions are universal. The facial expressions for happiness, sadness, anger, surprise, fear, and disgust are the same across cultures. 2) Body Movements and Posture: Consider how your perceptions of people are affected by the way they sit, walk, stand up, or hold their head. The way you move and carry yourself communicates a wealth of information to the world. This type of non-verbal communication includes your posture, bearing, stance, and subtle movements. 3) Gestures: Gestures are woven into the fabric of our daily lives. We wave, point, beckon, and use our hands when we're arguing or speaking animatedly- expressing ourselves with gestures often without thinking. However, the meaning of gestures can be very different across cultures and regions, so it's important to be careful to avoid misinterpretation. 4) Eye Contact: Since the visual sense is dominant for most people, eye contact is an especially important type of non-verbal communication. The way you look at someone can communicate many things, including interest, affection, hostility, or attraction. Eye contact is also important in maintaining the flow of conversation and for gauging the other person's response. 5) Touch: We communicate a great deal through touch. Think about the messages given by the following: a firm handshake, a timid tap on the shoulder, a warm bear hug, a reassuring pat on the back, a patronizing pat on the head, or a controlling grip on your arm. 6) Space: Have you ever felt uncomfortable during a conversation because the other person wasstanding too close and invading your space? We all have a need for physical space, although that need differs depending on the culture, the situation, and the closeness of the relationship. You can use physical space to communicate many different non-verbal messages, including signals of intimacy, aggression, dominance, or affection. 7) Voice: It's not just what you say, it's how you say it. When we speak, other people "read" our voices in addition to listening to our words. Things they pay attention to include your timing and pace, how loud you speak, your tone and inflection, and sounds that convey understanding, such as "ahh" and "uh-huh." Think about how tone of voice, for example, can indicate sarcasm, anger, affection, or confidence. 28

How to Improve Verbal and Non-Verbal Communication? Verbal communication is enhanced when a person is an effective listener. Listening doesn't simply mean hearing; it necessitates understanding another person's point of view. Take the time to think before you speak to ensure that you articulate yourself clearly. Let other people interject and have the floor. Allow time for reflection on the subject at hand. Watching other people's body language, facial expressions and intonations, and being conscious of your own physicality and feelings can enhance non-verbal communication. Record yourself with both a video camera and an audio recorder to see how you communicate non-verbally. Are your gestures matching your words, or giving away what you're really thinking? Being aware of what we say and how we say it is the first step to successful communication. The ability to adapt quickly to the situation and form of communication at hand is a skill that people continue to hone for a lifetime.

Mass media approach in Educational Technology Mass media is the tool of science and technology that can convey loads of information to larger section of people within short time span. For example newspaper, TV, radio, internet etc. However now a days this mass media technology is utilized for educational purposes. Hence educational technology has been flourished with mass media approach.

Mass media

have proved to help in classifying concepts, stimulating group and individual activities, developing a collective critical awareness, changing attitudes, imposing a new structure or organisation on certain subjects and encouraging originality and creativeness.

Therefore,

teachers have to be properly motivated and made interested in the use of such materials. And they have also to be trained and oriented in the adequate use and maintenance of the materials.

There are a good number

of media for mass communication such as radio, Television, newspapers and films etc. Previously, the

mass media in the form of illustrative were only put to marginal and individualised use. There was neither any coherent thinking nor a scientific organisation of these materials in the educational process. But their increased use has been mainly due to interest and initiative of certain teachers.

The media of communication is the medium by which a piece of information or knowledge is communicated to us. This medium is the message, which is of greater importance. Because, the same piece of information when conveyed on a printed page or over the telephone by radio, or television will appear different and have entirely a different effect on us. Hence the effectiveness of a piece of information depends upon the medium through which it is imparted. Thus, the mass- media

are not only the messages, but also the massage. Because, it massages the sensory organs and stimulates them to respond actively.

Hence,

the mass media is very important for class room teaching as a part of the process of instruction. The sole objective is to improve the teaching-learning process with the use of various media. Therefore, the main purpose of mass-media in education is to benefit more students with fewer teachers or to obtain quality

education.

In fact, the mass media have become a well of message around the world of today and have entered into all the structures of daily life,

that can be used and in fact is being used as a means of education. So the role of mass media in education is gaining importance every day.

Importance of Mass Media: 1.

Mass Media provide information to the mass within a less time. 29

2. It takes a wide coverage of information regarding anything that is happening in any comer of the world. 3. It brings the entire world to the individual or

to the classroom. Children spend hours together in front of the television and can visualize, hear and acquire knowledge about

the world. 4. These media easily reach groups, allow repeated use, give more reality, influence attitudes, show cause and effect relationships and ultimately motivate the audience. 5. It sends information to remote places and helps in distant learning. 6. It helps in modification of attitudes, inculcation of desirable values

and acquaintance with cultural heritage. 7. Mass media acts as an agency of social change. 8.

Mass media are useful for reinforcing group dynamics and interpersonal communication. 9. Mass media as means of communication make ideas clear to children and help them to acquire correct knowledge. They help in simplifying and in giving vividness to explanation. 10.

Mass Media make the instruction concrete and stimulate interest and excite curiosity in things.

Education today, therefore, has a far greater responsibility than it had ever before. It has to meet the demands of a dynamic world which change its character every day. Contemporary education has to be more comprehensive and complete than it was ever before.
The role of the various agencies of education like home, society, community etc. has consequently increased, so has the role of the mass media like television, radio, cinema, newspaper increased. So
now-a -day, press, radio, cinema, television, etc. are becoming more and more important in an individual's life. Mass media in education are press, radio, motion - picture, television, etc. So mass media are many and these are technically called passive agencies of education. They influence the attitude and behaviour of the people indirectly. These agencies cover entertainment, informatory propaganda, historical record, education and improvement of moral judgement and moral tone of the people. 30
Unit: II Designing Instructional System and Programmed Instruction In this unit, You will learn about, Introduction to Instructional System ➢ Formulation of Instructional Objectives ➢ Task Analysis • Designing of Instructional Strategies ➢ Lecture
Strategy ➢ Team Teaching Strategy ➢ Discussion Strategy ➢ Seminar Strategy ➢ Tutorial •

100%	MATCHING BLOCK 60/77	W

Programmed Instruction ➢ Meaning of Programmed Instruction ➢ Principles of Programmed Instruction • Types of Programmed Instruction ➢

100%	MATCHING BLOCK 64/77	SA	ED-001.docx (D161176864)

Linear or Extrinsic Programming ➢ Branching or intrinsic Programming ➢ Mathetics programming •

100%	MATCHING BLOCK 62/77	W

Development of Programmed Instruction ➢ Preparatory Phase (preparation of the programme) ➢ Development Phase (writing of the programme) ➢ Evaluative Phase (testing or evaluation) •

Computer Assisted Instruction ➢ Meaning

54%	MATCHING BLOCK 63/77	W

of Computer - Assisted Instruction ➢ Definitions of Computer-Assisted Instruction ➢ The origin of Computer-Assisted Instruction ➢ History of Computer - Assisted Instruction Introduction

to Instructional System 1)
Formulation of Instructional Objectives An instructional objective is a description of the result expected from a learning experience. It describes the performance or the behaviour expected of the leaner at the end of the learning activity. The term instructional objective is used interchangeably with performance, behavioural or learning objective. 31
Objectives are essential in all phases of instructions. Instructional objectives give the following advantages: • They provide a guide in selecting the materials to use and the methods to employ in teaching. • They provide standards for measuring acceptable student behaviour. • They serve as criteria for evaluating the quality and efficiency of instruction. • They serve as a contract between the learner and the instructor. • They allow self-evaluation on the part of the learner.
Classification of Educational Objectives Objectives may fall in any of the three domains. Years ago, Bloom and other educational psychologists came up with three classification of objectives to assist in developing assessment instruments. These learning domains are cognitive, affective, and psychomotor. A) Cognitive Objectives

Cognitive objectives deal with knowledge and the five intellectual abilities related to processing of knowledge. Objectives in the cognitive domain range from the simplest to the most complex. They are comprehension, application, analysis, synthesis, and evaluation. The learners must first possess the basic knowledge before they can engage in higher level of cognitive performance. In Bloom's taxonomy of cognitive domain, objectives are arranged in a hierarchy. The lowest level is knowledge, which involves recalling or recognizing an idea or concept. Comprehension is the second level. It is the ability to translate an idea or concept from one form to another. Application, on the other hand, is the use of an idea or information in a new situation. For instance, what you learn in the lecture, can you apply it in the field. The fourth level is analysis; to examine or break down a complex concept into parts or elements. Synthesis, which means putting together information in a new or unique way is the fourth level. The highest level in the hierarchy is evaluation. It is the process of making judgment about something using external criteria. Judging the internal coherence of a piece of communication such as a proposal or a plan is an example of evaluation. B) Affective objectives When the expected performance deals with actions associated with feelings and emotions, they belong to the affective or attitude domain. Affective outcomes are more difficult to assess since feelings are highly subjective and internal. 32
Skills in the affective domain describe the way people react emotionally and their ability to feel other living things' pain or joy. Affective objectives typically target the awareness and growth in attitudes, emotion, and feelings. There are five levels in the affective domain moving through the lowest order processes to the highest:
a)
Receiving The lowest level; the student passively pays attention. Without this level no learning can occur. Receiving is about the student's memory and recognition as well. b) Responding The student actively participates in the learning process, not only attends to a stimulus; the student also reacts in some way.
c)
Valuing The student attaches a value to an object, phenomenon, or piece of information. The student associates a value or some values to the knowledge they acquired.
d)
Organizing The student can put together different values, information, and ideas and accommodate them within his/her own schema; comparing, relating and elaborating on what has been learned. e) Characterizing The student holds a particular value or belief that now exerts influence on his/her behavior so that it becomes a characteristic. C) Psychomotor Objectives
Psychomotor objectives are those having to do with manual and motor skills. Physical activities and other skills that require body coordination belong to this domain. Skills in the psychomotor domain describe the ability to physically manipulate a tool or instrument like a hand or a hammer. Psychomotor objectives usually focus on change and/or development in behaviour and/or skills. Bloom and his colleagues never created subcategories for skills in the psychomotor domain, but since then other educators have created their own psychomotor taxonomies. Simpson (1972) proposed the following levels:
a)
Perception The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation. Examples: Detects non-verbal communication cues. Estimate where a ball will land after it is thrown and then moving to the correct location to catch the ball. Adjusts heat of stove to correct temperature by smell and taste of food. Adjusts the height of the forks on a forklift by comparing where the forks are in relation to the pallet. 33 Key Words: chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects. b) Set Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations (sometimes called mindsets). Examples: Knows and acts upon a sequence of steps in a manufacturing process. Recognize one's abilities and limitations. Shows desire to learn a new process (motivation). NOTE: This subdivision of Psychomotor is closely related with the - Responding to phenomena subdivision of the Affective domain. Key Words: begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers.
c)
Guided response The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practising. Examples: Performs a mathematical equation as demonstrated. Follows instructions to build a model. Responds to hand-signals of instructor while learning to operate a forklift. Key Words: copies, traces, follows, react, reproduce, responds.
d)
Mechanism This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency. Examples: Use a personal computer. Repair a leaking tap. Drive a car. Key Words: assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches.
e)

Complex overt response The skilful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance. For example, players will often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce. f) Adaptation Skills are well developed and the individual can modify movement patterns to fit special requirements. Examples: Responds effectively to unexpected experiences. Modifies instruction to meet the needs of the learners. Perform a task with a machine that it was not originally intended to do (machine is not damaged and there is no danger in performing the new task). Key Words: adapts, alters, changes, rearranges, reorganizes, revises, varies. g) Origination Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills. Examples: Constructs a new theory. Develops a new and comprehensive training programming. Creates a new 34
gymnastic routine. Key Words: arranges, builds, combines, composes, constructs, creates, designs, initiate, makes, originates. `The major criterion in determining the domain to which an instructional objective belongs to is the primary performance called for. For instance, when the objective has something to do with knowledge or mental ability, it belongs to the cognitive domain. When the expected performance deals with attitude, it belongs to the affective domain. When it relates with skills or physical activity, then it can be classified as psychomotor or skills domain. Writing Instructional Objectives Different authors discuss parts of an instructional objective differently, however there common parts. Minnick (1989) for example gave 4 parts on instructional objective, namely, preamble, verb, object, and chunk. Other authors give 3 parts only, verb, the conditions/restrictions under which the behaviour is to be demonstrated, and the criterion for acceptable performance. Preamble. The first part or the beginning of the objective that set the stage to follow is the preamble. Examples of preambles are as follows: 1. After reading the module 2. At the end of this presentation 3. This lecture will enable Verb. The second part of the objective is the verb. The emphasis here is on the action or behavior the learner is to perform. When we state our objectives, we should use verbs that are specific, measurable, and observable. Look at the following lists of words and see the difference between them. A B Identify Understand Describe Know Compare Appreciate Construct Learn Words in list A are specific whereas words in list B are vague and could be open to many interpretation. Minnick (1989) calls specific verbs closed and the verbs that are vague as open verbs. They convey various meanings to different people. Use closed or specific verbs when writing your objectives.
Object. The third part of an objective is the object of the verb. While the verb tells what you want the learner to do, the object tells him or her, what to do on what. Look at the following examples of objectives that contain the 3 parts mentioned: 1. After reading the lesson , you will be be able to define communication. 2. After this presentation, you should be able you to write instructional objectives. 3. At the end of the lesson, the trainees should be able to use television as teaching aids. 35
2) Task Analysis Task refers to work to be done in a fixed time period to achieve a goal. The term "task" is often used interchangeably with activity or process. Task analysis means breaking down of certain activity into several small steps to achieve the goal easily. Task analysis often results in a hierarchical representation of what steps it takes to perform a task for which there is a goal and for which there is some lowest-level "action" or interaction among humans and/or machines: this is known as Hierarchical Task Analysis. Tasks may be identified and defined at multiple levels of abstraction as required to support the purpose of the analysis. A Critical Task Analysis, for example, is an analysis of human performance requirements which, if not accomplished in accordance with system requirements, will likely have adverse effects on cost, system reliability, efficiency, effectiveness, or safety. Task analysis is often performed by human factors and ergonomics professionals. Task analysis may be of manual tasks, such as bricklaying, and be analysed as time and motion studies using concepts from industrial engineering. Cognitive task analysis is applied to modern work environments such as supervisory control where little physical work occurs, but the tasks are more related to situation assessment, decision making, and response planning and execution. Task analysis is also used in education. It is a model that is applied to classroom tasks to discover which curriculum components are well matched to the capabilities of students with learning disabilities and which task modification might be necessary. It discovers which tasks a person hasn't mastered, and the information processing demands of tasks that are easy or problematic. In behaviour modification, it is a breakdown of a complex behavioural sequence into steps. This often serves as the basis for chaining. The results of task analysis are often represented in task models, which clearly indicate the relations among the various tasks, An example notation used to specify task models is ConcurTaskTrees (by Fabio Paternò), which is also supported by tools that are freely available. In the field of Education task analysis is related to the planning teaching learning phase. In the field of
Education task analysis is related to the planning teaching learning phase. I.K. Davies, in his book "The Management of Teaching", has written about the following three activities which are to
be followed

by the teacher during planning teaching: 1. Task Analysis 2. Identification of Teaching Objectives 3. Writing the Teaching Objectives in Behavioural Terms 2. Task Analysis In task analysis, the activities related to the contents are analysed. If task analysis is not carried out properly,
expected achievement
is not possible. Hence, task analysis has special importance. According to I.K. Davies, four activities
are included
in task analysis: (i) Description of activities which are to be learnt by the pupil. (ii) Identification of expected behaviours. (iii) Identification of those stimuli and conditions with the help of which pupils may show expected behaviours. 36
(iv) Determination of norms for expected performance or achievement Remember that through task analysis, proper decisions are made regarding learning objectives, teaching strategies and tactics. Task analysis is of the following three types: (i) Content Analysis or Topic Analysis (ii) Job Analysis (iii) Skill Analysis (i) Content Analysis or Topic Analysis: In content analysis, the content or topic is analyzed on educational and intellectual basis. In the words of I.K. Davies, "It is the analysis of topic or content unit to be taught into its constituents or elements and synthesize into logical consequence."Since many techniques are used for content analysis but matrix techniques of I.K. Davies is considered most useful. According to this technique, content is divided into sub-topics first of all which are meaningful and completely separate from each other. Then, these sub-topics are psychologically arranged in a sequence. Then, each sub-topic is divided into its elements and arranged in a sequence. It is important that each element of the sub-topic is meaningful, complete and separate from each other like sub-topics of the content are arranged in a sequence on the basis of certain laws and maxims of teaching. Such as i)
From simple to complex (ii) From known to unknown (iii) From concrete to abstract (
iv) From whole to part (v) From Psychological to Logical. Hence, in content analysis, both activities of analysis and synthesis are included. We can represent the content analysis in the through I.K. Davies matrix technique. Teacher should follow the following sources to present the content or topic by analysis: (i) Study of Standard Text-Book (ii) Knowledge of Student's Needs (iii) Understanding Educational Needs (iv) Utility of Teaching Aids (v) Possibilities of Examination System (ii) Job Analysis: This step is concerned with 'what is to be done in the task.' Hence, in this phase, physical and psychomotor activities are determined and sub-processes are analyzed. (iii) Skill Analysis: The skill analysis is the next stage of job analysis. In this step, it is emphasized how the work
is accomplished.
It includes all those tasks which need skill, but the skill analysis is done only for questioning and diagnosis activities. Designing of Instructional Strategies 1. Lecture Strategy The word lecture comes from the Latin word lectus, from the 14th century, which translates roughly into “to read.” The term lecture, then, in Latin, means “that which is read.” It wasn't 37
until the 16th century that the word was used to describe oral instruction given by a teacher in front of an audience of learners. In lecture method a teacher tries to present a segment or unit of the desired content material of a subject to a group of learners through lecturing (verbal communication of ideas). It aims to attain the specific teaching-learning objectives related particularly to the cognitive and affective domains of the learner's behaviours. The lecture method, as an oldest traditional mode of teaching, may prove quite advantageous in so many ways for the present day classroom teaching-learning. The main criticism labelled against the use of it lies in its focusing understanding and reflective levels. Today, lecturing is a teaching method that involves, primarily, an oral presentation given by an instructor to a body of students. Many lectures are accompanied by some sort of visual aid, such as a slideshow, a word document, an image, or a film. Some teachers may even use a whiteboard or a chalkboard to emphasize important points in their lecture, but a lecture doesn’ t require any of these things in order to qualify as a lecture. As long as there is an authoritative figure (in any given context) at the front of a room, delivering a speech to a crowd of listeners, this is a lecture. Advantages
of
Lecture Strategy • Gives the instructor the chance to expose students to unpublished or not readily available material. • Allows the instructor to precisely determine the aims, content, organization, pace and direction of a presentation. In contrast, more student - centered methods, e.g., discussions or laboratories, require the instructor to deal with unanticipated student ideas, questions and comments. • Can be used to arouse interest in a subject. • Can complement and clarify text material. • Complements certain individual learning preferences. Some students depend upon the structure provided by highly teacher- centred methods. • Facilitates large-class communication. Disadvantages
of Lecture Strategy •
Places students in a passive rather than an active role, which hinders learning. • Encourages one-way communication; therefore, the lecturer must make a conscious effort to become aware of student problems and student understanding of content without verbal feedback. • Requires a considerable amount of unguided student time outside of the classroom to enable

understanding and long-term retention of content. In contrast, interactive methods (discussion, problem-solving sessions) allow the instructor to
influence students when they are actively working with the material. • Requires the instructor to have or to learn effective writing and speaking skills. 2. Team Teaching Strategy Team teaching involves a group of instructors working purposefully, regularly, and cooperatively to help a group of students of any age learn. Teachers together set goals for a course, design a syllabus, prepare individual lesson plans, teach students, and evaluate the 38
results.
They share insights, argue with one another, and perhaps even challenge students to decide which approach is better. Team teaching
as an innovation in the field of teaching and learning, aiming to improve its process and products by calling upon the joint cooperative efforts of a team of the personnel (teachers and others) by utilizing the resources available in a given teaching- learning situation, at the proper time and in a proper way. Teams can be single-discipline, interdisciplinary, or school-within-a-school teams that meet with a common set of students over an extended period of time. New teachers may be paired with veteran teachers. Innovations are encouraged, and modifications in class size, location, and time are permitted. Different personalities, voices, values, and approaches spark interest, keep attention, and prevent boredom. The team-teaching approach allows for more interaction between teachers and students In team teaching a group of teachers, working together, plan, conduct, and evaluate the learning activities for the same group of students. In practice, team teaching has many different formats but in general it is a means of organising staff into groups to enhance teaching. Teams generally comprise staff members who may represent different areas of subject expertise but who share the same group of students and a common planning period to prepare for the teaching. To facilitate this process a common teaching space is desirable. Team teaching requires proper • planning with regards to staffs, their abilities, specialization • Goal setting • Deciding the target group, time frame • Conducting meeting, responsibility allocation • Deciding strategy, media, method • Implementation of plan and media strategy • Resource Management • Evaluation • Feedback and Continuity of Programme with Modification Advantages
of Team Teaching
Team teaching is an approach which involves true team work between two qualified instructors who, together, make presentations to an audience. The instructional advantages of team teaching include: (1) Lecture-style instruction is eliminated in favour of a dynamic interplay of two minds and personalities. (2) Teaching staff act as a role models for discussion and disagreement. (3) Team teaching makes effective use of existing human resources. (4) Team teaching has the potential for revitalizing instructional capabilities through a process of dialogue. (5) Interest in traditional courses can be stimulated as students share the enthusiasm and intellectual discourse that the lecturers Communicate. (6) The effective use of facilities is possible. (7) Team teaching provides opportunities for interaction with the audience. 39 Disadvantages
of Team Teaching (1)

Team teaching is not always successful. Some teachers are rigid personality types or may be wedded to a single method. (2) Some simply dislike the other teachers on the team. Some do not want to risk humiliation and discouragement at possible failures. (3) Some fear they will be expected to do more work for the same salary. Others are unwilling to share the spotlight or their pet ideas or to lose total control. (4) Team teaching makes more demands on time and energy. Members must arrange mutually agreeable times for planning and evaluation. (5) Discussions can be draining and group decisions take longer. (6) Rethinking the courses to accommodate the team-teaching method is often inconvenient. (7) Opposition may also come from students, parents, and administrators who may resist change of any sort. Some students flourish in a highly structured environment that favors repetition. Some are confused by conflicting opinions. (8) Too much variety may hinder habit formation. (9) Salaries may have to reflect the additional responsibilities undertaken by team members. Team leaders may need some form of bonus. Such costs could be met by enlarging some class sizes. Non-professional staff members could take over some responsibilities. Personal concerns usually expressed about team teaching include: ➢ not all team members will contribute equally; ➢ teachers do not understand how to make the team work; ➢ there will be personality conflicts to deal with in addition to the teaching itself; a preference for working alone; all the work will fall on the team leader/senior subject expert; ➢ it will be too difficult to cover all the course content; team meetings will be a waste of time. 3. Discussion Strategy The discussion strategy involves some sort of discussion, i.e. exchange of ideas between students and teachers or among a group of students resulting in some learning for the realization of the predetermined teaching learning objectives. It may prove quite helpful in a number of teaching-learning situations if handled properly in an able leadership. Discussion means to engage in an orderly verbal interchange and to express thoughts on a particular subject. This is the Discussion Method, also called the Socratic Method after the Ancient Greek philosopher Socrates, who would engage his students with questions and dialogue. Because the class is small, the tutor is able to determine each student's progress, and students have ample occasion to make their difficulties known. There is a true meeting of the minds. The Discussion Method demands that students come to class well prepared. Compelling them to think out their arguments in advance and to answer their peers' questions and counter-arguments, it sharpens their powers of reason, analysis, and articulation. It thus provides them with fundamental skills necessary for success in any discipline or profession. Discussion methods are a variety of forums for open-ended, collaborative exchange of ideas among a teacher and students or among students for the purpose of furthering students thinking, learning, problem solving, understanding, or literary appreciation. Participants 40
present multiple points of view, respond to the ideas of others, and reflect on their own ideas in an effort to build their knowledge, understanding, or interpretation of the matter at hand. Discussions may occur among members of a dyad, small group, or whole class and be teacher- led or student-led. They frequently involve discussion of a written text, though discussion can also focus on a problem, issue, or topic that has its basis in a "text" in the larger sense of the term (e.g., a discipline, the media, a societal norm). Other terms for discussions used for pedagogical purposes are instructional conversations (Tharp & Gallimore, 1988) and substantive conversations (Newmann, 1990). A defining feature of discussion is that students have considerable agency in the construction of knowledge, understanding, or interpretation. In other words, they have considerable "interpretive authority" for evaluating the plausibility or validity of participants responses. To illustrate, the following excerpt is taken from a discussion between a teacher and a small-group of second-grade students (from Eeds & Wells, 1989). They are discussing the short story, "Me and Neesie," by Eloise Greenfield. The story is about a girl, Janell, and her imaginary friend, Neesie, and the teacher and students are trying to understand why Neesie is at school with Janell for the day. Advantages
of Discussion Strategy • emphasis
on learning instead of teaching. • participation by everyone in the class. • development of democratic way of thinking. • training in reflective thinking. • training in self-expression. • spirit of tolerance is inculcated. • learning is made interesting. Disadvantages
of Discussion Strategy •
Discussion method is not appropriate for all the topics. • It can be used only to students who have some basic knowledge in the topic. • some of the students may feel shy or reluctant to take part while others may try to dominate • Teacher may lose control over the students and they may end up in quarelling. 4. Seminar Strategy
Seminar is an instructional strategy which involves paper reading followed by group discussion to clarify the complex aspects of theme. Seminar generates
a situation for a group to have guided interaction among themselves on a theme which is generally presented to group by one or more members.
Participants who present the theme should study the theme thoroughly to make selection of relevant material. Collected material is presented in the form of paper. It

is circulated among the participants in advance. It provides the structure of theme, to facilities its communication. A seminar is an advanced group technique which is usually used in higher education. It is an instructional technique it involves generating a situation for a group to have a guided interaction among themselves on a theme. It refers to a structured group discussion what usually follows a formal lecture or lectures
often in the form of an essay or a paper presentation
on a theme. 41
Principles Seminar is a form of a class organization that utilizes a scientific approach for the analysis of a problem chosen for discussion. It is a discussion method of teaching where an informal group of 10-15 (not more than 25) learners participate to solve problems in a scientific approach and analysis. It is an organized, guided discussion with a focus on the discovery of new relationship by the participating individuals. It differs from intellectual initiative. The student plays an active role in seminar. The objective of the seminar is to give students opportunity to participate in methods of scientific analysis and research procedures. Students are expected to do considerable library search prior to the seminar. A seminar group is mainly concerned with academic matters rather than individual students and commonly involves the reading of an essay or paper by one group member followed by a discussion by the total group on the topic. The role of a teacher is to help students to select, formulate and resolve the most significant problems and suggest the available sources of information. As the seminar progresses, the students assume greater responsibility for addressing the problems and conducting discussion. Features of Seminar • Teacher is the leader. • The group generally consists of 10 to 15 participants • An ideal seminar lasts for 1-2 hrs. The topic is initially presented by the presenter followed by group discussion. • The leader should keep the discussion within limits so the focus of discussion can be mentioned. • Care should be taken to avoid stereotypes. • In student seminars, students present their data in an informal way under the leadership of the teacher, followed by a teacher monitored discussion. • All members take part in discussion in an informal but orderly manner. • The chairman should be skilled in encouraging the timid participants. • A student secretary may record the problems that come up and the solutions given to them. Organizing a seminar • Define the purpose of the seminar. • Relate the topic of seminar and discussion to the main concept or the objectives to be attained. • Direct and focus on the discussion topic. • Help students to express their ideas and keep the discussion at a high level of interest so that the students listen attentively to those who contribute the ideas. • Plan comments and questions that relate to the subject and also guide and direct the discussion. • Set time limitations for each person's contribution. • Guard against monopoly of the discussion by any member of the seminar. • Plan for summary at intervals during the discussion and also at the end of the discussion and relate the ideas expressed to the purpose of discussion. 42
• Have the discussion recorded by a student as a recording secretary or by tape recording. • Plan for teacher and student self evaluation of the progress made towards the immediate objectives. Role of A Teacher • Select the topic.(Give reasonable time for preparation). • Remain in the background in the seminar, but sit where the whole group can be seen. • Prepare to help out in the initial stages of using this method in case of long silence. • Be sure that essential points are not overlooked and that gross inadequacies are corrected (preferably by the other members of the class). • Make sure that all members have a share in the discussion and that irrelevant discussion is avoided. Advantages • Student plays an active role; it pre supposes that the student has background knowledge. • A properly conducted seminar has potentials to teach students the method of scientific analysis and technique or research. • Individual student and the group as a whole try to solve the problem. • Exchange of facts and efforts to crystallize group opinion is a clear advantage in seminar method. • The problem solving skills of the students are sharpened by participation. • The students develop vocabulary, articulation, problem solving and critical thinking skills as they participate in the seminar. • A seminar helps in self learning and promotes independent thinking. • Ability to see own problems is increased because of personal difficulties can be compared with those of the group. • Skilfully directed seminar promotes group spirit and co-operativeness. Disadvantages • Seminar is a time consuming process. • It cannot be applied to new students. • Timid students may initially feel nervous. • If subject knowledge is poor, unnecessary discussions arise. • The approach to problem solving extends to student's professional and personal activities. 5. Tutorial Method The tutorial method help in supplementing or enriching the traditional classroom instruction by calling up on a tutor to provide his personalized and individualized services to a student or a small group of students- tutees for their required betterment. A tutorial is either a one-on-one session between a teacher and a student, or a very small group (three or four) of students and an instructor, where the learners are at least as active in discussion and presentation of ideas as the teacher. It is the follow up study of lecture. 43

It is highly Individualized remedial teaching. It is based on principles of individual difference and remedial teaching. It involves steps such as • Diagnosis • Prescription • Follow up To remove this drawback of group-teaching, pupils are divided into small groups so that the personal problems which came across during group teaching may be solved successfully. Hence, a tutorial is a sub-part of the class in which a teacher tries to solve the problems of the small groups of the pupils through individual teaching. Tutorials are of three types : 1. Group Tutorial 2. Supervised Tutorial 3. Practical Tutorial. 1. Group Tutorial: Group Tutorials are conducted to solve the problems of the grown up pupils of average level. It should be remembered that the group tutorials can only be organized successfully by a teacher who possesses the full knowledge of Group Dynamics and Social Psychology. 2. Supervised Tutorial: In the supervised tutorials, the talented pupils and the teachers discuss the problems time to time. The pupils put up their difficulties. Then the teacher tries to solve those problems. In this way, after a discussion between a teacher and the pupils, the solutions to some problems come up. 3. Practical Tutorial: Practical tutorials are conducted to develop the physical skill and to achieve the objectives of psychomotor skill. Pupils have to work in the laboratory for this. Such tutorials are more useful for younger and pupils of lower-classes. Some people consider the teacher as primary and pupils as secondary in conducting the tutorials. In such a situation, if a tutorial acquires the form of a lecture, then this will be considered as autocratic strategy. Contrary to this, if the pupils are more active instead of the teacher, then it will definitely occupy its main place in democratic strategies. Prof. Bloom's view is that the discussion should be based on the problem and the teacher should help the pupil to the maximum to solve the problem.

Programmed Instruction Introduction

Programmed Instruction or programmed Learning is one of the
most
innovative, highly individualized, systematic and very recent type of
teaching- learning
process. It is often referred as auto- instruction and is extremely useful for self learning and equally beneficial for class room instruction as well. This type of Instruction actually started during the era of Aristotle and the process of Programmed Learning was for the first time practised by Plato but this kind of Instruction could not progress due to lack of resources at that time. In 1954 James Howard and B F Skinner developed the Auto instruction Method which fashioned the base for Programmed Learning. For the first time in 1963 NCERT started the preparation of Material for programmed Instruction/ Learning and sincere attempts were made for the use of 44
programmed instructions in the class room and in providing programmed study material to the students of distance education. At present suitable self- instructional programmed materials have been prepared for different subjects and grades which are used by different students for self instructional Purpose. Programmed learning is extensively used in the teaching learning process of all those subjects which include practice and drill work and require logical and systematic study.

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Origin of Programmed Instruction Although attempts at processes resembling programmed instruction date back to the 1920s (Pressey, 1926), the actual term is probably derived from B. F. Skinner's (1954) paper, "The Science of Learning and the Art of Teaching," presented at the University of Pittsburgh's conference of Current Trends in Psychology and the Behavioural Sciences on March 12, 1954. Skinner's remarks reflected his reaction to a 1953 visit to his daughter's fourth-grade arithmetic class (Vargas and Vargas, 1992). Skinner (1954, pp. 90–91) argued that schools were unable to accomplish the type of teaching that eventually leads to original thinking because: • Schools relied on aversive stimulation or control; as Skinner described it, children worked to "avoid or escape punishment." • Schools did not pay attention to the contingencies of reinforcement. • Schools lacked a systematic plan for learning skills, or, in Skinner's words, "a skillful program which moves forward through a series of progressive approximations to the final complex behaviour desired." • Schools too infrequently provided reinforcement. Skinner suggested a systematic plan – or programmed instruction – as the vehicle to accomplish the changes that needed to occur in classrooms, and in his description of that plan he made two statements that illustrate the importance of instructional design and its relationship to technology. He stated that "education is perhaps the most important branch of scientific technology" (1954, p. 93), and "in the present state of our knowledge of educational practices, scheduling [of behaviors and consequences] appears to be most effectively arranged through the design of the material to be learned" (p. 94, emphasis added). Skinner was at the forefront in articulating the need to accomplish this scheduling of behaviors and consequences and a program for effective and efficient learning through operant conditioning. Operant conditioning is a form of conditioning that reinforces desired behaviour and it is this behaviourist theory that forms the basis for programmed instruction. During the 1950s, educators and psychologists became concerned that the mass schooling precipitated by increasing demands on public education were not meeting an individual's needs for personal attention in the learning process, and they suggested that teaching machines could restore the "important features of personal instruction" (Skinner, 1986, p. 103). Additional teaching machines were introduced in the 1960s, largely as a result of the success of programmed instruction. A variety of simple machines were introduced, including Skinner's teaching machine, the Porter device, the Bell device, the punchboard, the Subject Matter Trainer by Briggs, the Arithmetic Machine by Skinner and Zeaman, and the Polymath by Rothkopf (Ysewijn, 1993). During the 1970s and 1980s, as the first computers were being placed in the classrooms of many schools, behavioural theories became quite popular. Advances in programming and computer technology also spurred the popularity of programmed instruction by making it 45 possible to teach a wide range of topics and skills. During this period programs for nearly every topic covered in a traditional school curriculum (i.e., math, science, language arts, social studies) were written for a variety of teaching machines (which eventually gave way to the personal computer) (Chen, 2006).Programmed instruction is now generally considered to be one appropriate instructional approach among many, and most appropriately utilized in conjunction with a variety of other instructional methods. Meaning of Programmed Instruction Programmed instruction / learning simply means learning performed or instruction provided by a teaching Machine or programmed textbooks. In order to understand the meaning of programmed instruction we will through light on some definitions of programmed instruction put forward by different scholars: Smith and Moore (1962): Programmed instruction is the process of arranging the material to be learned into a series of sequential steps, usually it moves the students from a familiar background into a complex and new set of concepts, principles and understanding. Leith (1966): Programmed is a sequence of small steps of instructional material (called frames), most of which require a response to be made by completing a blank space in a sentence. To ensure that expected responses are given, a system of queuing is applied and each response is verified by the provision of immediate knowledge of result. Such a sequence is intended to be worked at the learners own pace as individualized self instruction. Jacobs and et al (1966): Self-instructional programmes are educational materials from which the students learn. These programmes can be used with many types of students and subject matter, either by themselves, hence the name "self-instruction" or in combination with other instructional techniques. Espich and Williams (1967): Programmed instruction is a planned sequence of experiences, leading to proficiency in terms of stimulus responses relationship, that have proven to be effective. Susan Markle (1969): It is a method of designing a reproducible sequence of instrumental events to produce a measurable and consistent effect on the behaviour of each and every acceptable student. Gulati and Gulati (1976): Programmed learning, as popularly understood, is a method of giving individualized instruction, in which the student is active and proceeds at his own pace and is provided with immediate knowledge of results. The teacher is not physically present. The programmer, while developing programmed material, has to fallow the laws of behaviour and validate his strategy in terms of student learning. Owing the above definitions we came to the conclusion that Programmed instruction / learning is a systematically planned, empirically established and effectively controlled self-instructional technique for

providing individualized instruction to the learner through logically sequenced small segments of the subject matter by using the principles of operant conditioning and schedules of reinforcement. 46

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Principles of
Programmed Instruction
The fundamental principles of a good programmed learning strategy are as under: 1.
Principle of Small Steps: It is a well known fact that a learner learns better
it
the content matter is presented to him in suitable small steps.
Therefore,
in programmed instruction the subject matter is divided into sequenced and meaningful very small steps called frames, which are presented to the learner one at a time for responding. 2. Principle of Active Responding: In Programmed Instruction a learner is provided information in frames and he is supposed to be very active in responding to the individual frames as the learner is provided only one frame at a time and is allowed to proceed further only on completing the previous frame, thereby keeping him active and meaningfully busy throughout the programme. 3. Principal of Immediate Reinforcement: The learner understands better when he is motivated to learn by receiving the information of the result just immediately after responding, which is also in accordance with the psychological phenomenon of reinforcement in learning. In programmed instruction it is important to provide immediate results of individual frames so that the learner will get appropriate reinforcement in time. 4. Principle of Self-pacing: The concept of programmed Instruction has actually emerged on the concept of providing learners an opportunity to learn at their own pace.
The programme should be prepared keeping in
view the principle of self-pacing, so that the learner can
respond and move
from one frame to another according to his own speed of learning. 5.
Principal of Student -
testing:
In programmed learning as the learner gets the results of his learning while the process of learning which provides him continuous evaluation of his own
learning. In this process
the learner has to leave the record of his own response because he is required to write a response for each frame
on
a
response sheet. This detailed record helps in revising the
programme
and
acts as a source for studying and improving the complex phenomenon of human
learning. Types of Programmed Instruction
Programmed Learning / instruction can be broadly divided into following types on the basis
of researches
and experimental studies in the field
of programmed instruction: 1.
Linear or Extrinsic Programming 2. Branching or intrinsic Programming 3. Mathetics programming 47

The first three types, Linear or Extrinsic Programming, Branching or intrinsic Programming and Mathetics programming represent the actual Programmed Instruction; the Ruleg system of programming is just the extension of Linear or Branching programming. 1) Linear or Extrinsic Programming: B.F. Skinner (1955), is considered the founder of this type of programmed instruction. It is directly related with his theory of "operant conditioning" and is based on the assumption that human behaviour can be shaped or conditioned gradually, step by step, with suitable reinforcement for each desired response. Consequently, in this programming,
the instructional material is sequenced into a number of meaningful small steps, called frames. These frames are presented
to the learned in the
arranged sequence, one at a time. The learner is required to respond actively at each step. Immediately
after responding, the learned is given information about the correctness of his response. It reinforces his behaviour and he may be motivated to learn the next frame in the arranged sequence. By proceeding from one step to another, the learner may be able to acquire the desired learning experiences. This type of programming is referred to as 'linear' as the sequence of frames and path of learning in this programmed learning is systematic and linear. (As shown in the 1
Here all the learners have to proceed through the same frames and in the same order.
The whole instructional procedure is well controlled. However, this control is quite extrinsic exercised by the programmer and so, the linear programming is also referred to as extrinsic programming.
Figure 1 : Arrangement of frames in liner programming
Normally the learner makes only correct responses and only positive reinforcement, if the learner does not respond correctly to a particular frame, he may be required either to repeat the frame or be acquainted with the correct response. In any case he is not allowed to move to the frame unless he responds correctly to the present frame. 2.
Branching or intrinsic Programming Norman A. Crowder (1954), an American psychologist is credited for developing the branching programme of programmed instruction. In his own words,
branching or intrinsic programming is one which adapts to the need of the students without
a medium of an extrinsic device such as a computer,
In contrast to linear programming; this style provides an intrinsic arrangement in the sense that it is not controlled extrinsically by the programmer. Here, a learner is free to make decisions and is able to adapt the instruction to his needs. The basic assumptions underlying this style are as below: 1. When the learning material is presented in its totality or in the form of meaningful components or units, the learning gets better. 48
2. Learning takes place better if the students are made to learn on the pattern of traditional tutorial methods. 3. Due to the Student's exposure to the new material, basic learning takes place. 4. In a learning process, errors may occur. If an error occurs, it may be detected and corrected before proceeding further on the learning path the biggest advantage of branching programming is that the wrong responses do not necessarily hinder the learning of a correct response. 5. Learning takes place better if a
learner is allowed sufficient freedom to take decisions for adapting the instruction to his needs. 6.
Learning will be better if each response is used to test the success of the latest communication to the student and the testing is followed by remedial instruction. 7. Multiple-choice items help more in the learning process than the force choice single response items. Based on the above assumptions, the procedure for branching programme may be outlined in the following way: 1. The size of the frames is quite large in branching programming than that employed in linear programming and instructional material is divided into 'units' of material called 'frames'. Much information, one or two paragraphs or even a page, is provided in a frame. 2. The learner is provided more than one choice while responding to the frames as he is required to respond to multiple choice questions associated with the learning material of the frame.
He has to discriminate and choose one right answer. 3. The learner moves forward if he answers correctly, but is diverted (branched) to
one or more remedial frames if he does not. These frames explain the matter afresh, ask him questions to elicit the right answer and reveal his previous mistakes, and then return him to the original frame. 4.
This cycle goes on till the learner passes through the whole instructional material at his own pace. 49
Figure 2: A diagrammatic representation of the main path and branching in branching programming. Contribution of Skinner, Mager, Gilbert in Programmed Instruction: In 1943, Skinner and his two other colleagues started programming by teaching a pigeon to roll a small bowling ball by operant conditioning. By 1954, Skinner and James G. Holland devised the auto instructional methods which have served the present generation as basis for present work in programmed instruction. In Skinnerian programmed instruction whether mechanized or otherwise the learner is initially asked a question which he can easily answer correctly without any previous study of the
particular lesson. The learner is taught by the sequence of questions. He is asked more and more as the lesson proceeds in very small steps.

Robert Mager (1958) gave a new concept known as “Learner Controlled instruction” which is a kind of Socratic dialogue in reverse,
in which the learner led the instructor. The instructor remains silent until the learner himself stimulated the instructor with questions that suggested the needed illustrations, demonstrations, practice or some other help. In 1962, T F Gilbert gave formalized expression of his technology of education called Mathetics. Latter a number of educational experts including Pennington further worked on Mathetics and they devised the methods of preparing lessons on the mathatics.
3) Mathetics Programmed Instruction
Thomas F. Gilbert (1962) is the originator of the concept of mathetics programmed instruction. It

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is defined as a systematic application of reinforcement theory to the analysis and construction of complex repertoires which represent the mastery in subject matter. It is based on connectivist theory of learning. It is a reverse chaining approach. It is based on Principle of chaining, Discrimination and Generalization.

The word "Mahtetics" is derived from the Greeck word "Mathein" which means learn.

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Mathetics programming is based on following assumptions. 1. Chaining of responses helps in learning to reach up to mastery level. 2. Reverse chaining of stimuli helps in learning, i.e. from whole to part, from Complex to simple. 3. Completion of task provides motivation to students. Frames size is organized in small step but in a reverse chain i.e. from complex content to its small, simple units to attain mastery level; Frame structure is based on Demonstration-prompts-release. There are two types of frames: 1. Demonstration frames 2. Prescription frames. Responses are structured responses and responses determined by the programmer. Completion of task provides reinforcement. Wrong responses are ignored. Error helps in discrimination but not in learning. Its main purpose is to develop mastery of the content. Main 50 focus is on Mathematics and grammar. It used for higher classes useful for complex and difficult task. It is useful for developing concepts of mathematics and grammar. It can be used in Distance Education. Advantages of Mathetics Programming: 1.

It is a task oriented programme. 2. Results can be linked to concrete goals which we intend to achieve through a mathetics programme. 3. Its stress on learner success at 90/90 criterion level of mastery motivates the learner. 4. It utilizes the principal of backward chaining. 5. It is relevant, significant, meaningful and valid in the eyes of the learner and programmer.

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Limitations of Mathetics Programming: 1. Main emphasis is on mastery of the content rather than changes in behaviour of the learner. 2. Retrogressive chaining of stimuli if not effective for terminal behaviour. 3. It is very difficult to develop retrogressive learning package. 4.

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It is very technical in nature and such as demands a lot of skill, training and labour on the part of the programmer. 5. It is not suitable for learning the material of all subjects. 6.

Mathetics cannot be used for factual content. 7. Mathetics is not based on any sound

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learning theory. Development of Programmed Instruction The development of the programmed instruction material in the form of programmed text or computer-assisted instruction is a highly specialized job. The task involves the following main phases: 1. Preparatory Phase (preparation of the programme) 2. Development Phase (writing of the programme) 3. Evaluative Phase (testing or evaluation) 1) Preparatory Phase The preparatory phase occupies a very prominent place, in any scheme of the development of the programmed instructional material. It includes the planning and beginning. The experts of programmed instruction are of the opinion, that almost 25 percent time should be spent for the execution of the activities concerning this phase. In general, the following activities or steps are to be executed during this phase:

a)

Assortment of the Content / topic or units to be programmed The primary job of a programmer is that, he should concentrate on the wise selection of the topic or unit for his programming. The selection of the topic or content to be programmed should meet the following criteria: 1. Is any programme already available on the topics? 51 2. What are the difficulties that the topic cannot be taught by other already available methods? 3. Does it allow developing a simple, logical and systematic programme quite interesting useful and suitable from the angle of the learner? 4. Does it suites to the curriculum needs of the learner? 5. Whether the teacher has got the required specialization on the subject. 6. Does it really help in curtailing the teacher's burden? 7. Does it allow for setting the real and useful objectives in behavioural terms and design a criterion test to measure the outcomes of the results of the programmed learning? 8. Is it within the economic conditions of the people concerned. b) Describing the learners The programme is meant for the learners. Therefore, a programmer should know and describe the characteristics of the learners in terms of their age, gender, socio- economic and cultural background, intellectual level, interest, general scholastic abilities, aptitudes, previous experience potential of learning, etc. For this purpose, he may take the help of his own experience cumulative record and various other testing devices, interest inventory, aptitude tests, intelligence tests, achievement tests, diagnostic tests, etc. And conclude about the characteristics of the learners. c) Detecting objectives in behaviour terms The programmer has to set the definite instructional objectives for deriving the desired results, these objectives should be stated clearly in behavioural terms, or he should state clearly the type and extent of the behavioural changes to be expected from the learners after going through the developed programme. It is this description of the terminal behaviour of the learners that is aimed at in writing the instructional objects. The minimum requirement is this regard are mentioned below. i. Initially, the programmer has to select the domain – cognitive, effective or psychomotor of the behaviour for which the behavioural changes are to be sought. ii. The programmer has to take decision about adopting a particular approach, such as Mager's, Miller's or R.C.E.M. for writing instructional objectives in behavioural terms. While the Mager's approach serves the purpose of cognitive and affective objectives, the Miller's approach is meant for psychomotor objectives, and the R.C.E.M. approach can serve the objective belonging to all the three domains of the behaviour. Each approach has its own taxonomy (system of classification) of education objectives. iii. For writing an objective of a particular domain, suitable action verbs or mental processes are picked up from the list of action verbs or mental processes format in relation to the particular topic or content portion to be taught. The objectives can be written in behavioural terms by combining action verbs (in the case of Mager's or Miller's approach) or mental process (in the case of the R.C.E.M. approach) with the content. 52 d) Entry behaviour of the learners The objectives and their statements in behavioural terms point out the finishing point or terminal behaviour of the learners as a result of the given programmed instruction. However, one has to start with something for aiming to end with the terminal behaviour. This starting point with respect to one's behaviour is called his entry behaviour – the initial behaviour. Before going through the programmed instruction, this behaviour – like terminal behaviour – to be stated in clear terms so that the programmer may be very much clear about the programmed instructional material developed by him. Here, one has to describe the behaviour of the learner in terms of the prerequisite knowledge, skills, interest attitudes, etc. as illustrated below: Before going through the present programmed the learner is able to ..... Read/write/ define/observe/calculate/..... With ..... Efficiency or in ..... circumstances. e) Developing specific outlines of content The course content to be covered through the programme are decided on the basis of basic assumptions about the learners, their entry behaviour, objectives to be realized in the form of terminal behaviour, and the courses of study prescribed to them by authorities like Boards of School Education, and Universities. At the planning stage, the programmer is supposed to develop specific outlines of the related course contents. The course content is developed on the basis his own experience and observation of the related course, analysis of the curriculum, and consultation and help from subject matter experts and experienced teacher. After collecting the content material from the sources, the programmer may go ahead for preparing the outlines. This can be done in two ways: logically or psychologically Whereas logic demands systematic and orderly treatment of the subject, psychology advocates the arrangement that appeals to the basic interests and abilities of the learners. The programmer must try to organize the contents in such a way that it can suit both the purposes, i.e. logical and systematic treatment of the subject, based on the psychological requirement of the learners.

f)

Designing the criterion test At the planning stage, the programmer has to develop a criterion-referenced test to be administered at the completion of the programme for measuring its effectiveness in relation to the realization of the specific instructional objectives. The criterion-referenced tests are not the same as the traditional achievement or non-referenced tests. Whereas the traditional achievement tests are designed to measure individual differences and aim at comparing individual performances, the criterion-referenced tests are designed to ascertain the effectiveness of programme or instruction by measuring the learner's performance on clearly defined educational tasks. Through the criterion tests, the terminal behaviour of the learner reached after the completion of the unit of a programme is assessed for ascertaining the extent to which the set objectives have been realized. While designing the test one should keep in mind: (i) instructional objectives defined in behavioural terms should be well addressed in the test. (ii) As far as possible, there should be at least two to three items for each instructional objective. 53
(iii) The programmer should acquire desirable competency and skill in the preparation of the objective test items. use the objective-type question is obligatory for make a test item. (iv) The programmer has to see that items are free from any ambiguity or language and content and possess reasonable discrimination power as well as internal consistency It helps in avoiding repetition and elimination of useless or less useful items. (v) The items as well as the accompanied instructions of the test must be able to create the necessary conditions or situations calling the demonstration of the students or terminal behaviour for the assessment of the realization of instructional objectives. (vi) The programmer should try to establish the reliability and validity of the test. Reliability refers to a faith that can be put into a test and it can easily be verified through the test-retest method. The test may be repeated, and the extent to which the results are the same for the same individuals, the test is said to be reliable. Validity refers to the accuracy behaviour of the test. A valid test should always measure what it aims to measure. Validity of the test can be achieved by carefully going through item analysis, seeing that every item serves the purpose for which it is being constructed and comparing the results of the test with some already well- established valid tests or criterion. 2) Development Phase The development phase covers the actual writing of the programme. In writing the programme, besides taking decision about a particular style of a linear, branching or mathetics programme, the programmer takes all help from what is being done at the preparatory phase. The assumptions about the learner, his entry behaviour, the instructional objective fixed in the form of terminal behaviour, the outlines of the contents chosen, all are given due consideration while engaging in writing programme. The writing of the subject matter as programmed instructional material differs much from the ordinary textbook writing. Here, the programmer has to follow the spirit and principles of programmed learning.
The instructional material is to be broken into logically sequenced suitable small steps or segments of the subject matter called frames.
These frames are so designed and sequenced that the learned remains meaningfully busy and active by responding to them, one at a time, faces minimum or no failure, gets immediate reinforcement by receiving information of the result immediately after responding, and is
able to
respond and move
from one frame to another according to his own speed of learning.
In practice, the task of programme writing involves three steps, namely designing of the frames, sequencing of the frames and editing of the programme. Designing of the frames A frame represents the basic smallest unit of the instructional material that is to be presented to the learner at a time. It varies in size from a few words to a full page or more(as in the case of branching programme). It has three different components, namely stimulus (for information presentation), response (for responding by learner) and reinforcement (knowledge of result in the form of answer) as illustrated: 54
In writing the frames for developing a particular programme, the programmer has to make use of certain special techniques like priming and prompting for helping the learner respond correctly and proceed successfully (with minimum error rate) from one frame to another.
Priming: In the priming technique, attempts are made to pour the information into the minds of the learner for active responding in the way we pour in some water for drawing out water from a dry water pump. Let us now illustrate this technique with examples:

In the form of an extra stimulus is provided in the frame for helping the learner to respond correctly. Their use helps the learners in getting additional helping stimulus for responding to a given programmed material frame. It can be illustrated well through the following examples: Sequencing of the frames The task of arranging the frames is some systematic order (on the basis of logical and psychological principles) to lead a learner form his entry behaviour to terminal is termed as sequencing of the frames. Usually, the following three approaches are employed for the sequencing: 1. Matrix approach 2. Ruleg approach 3. Egrul approach In the Matrix approach, a matrix is prepared by putting the learning points and a major concept including sub-concepts, minor concept information points, etc. on one axis and the frames of the programme that lead to the behavioural change to the learner on the other axis. Thus, a glimpse on this matrix may reveal everything aimed and systematically covered through the frames.
In the Ruleg (rule + example) approach, deductive reasoning is employed in sequencing the frames. The fames putting or emphasizing rules or principles are given first. These are followed by examples frames depicting the meaning and application of the rule or principle. In Egrul (example + rule) approach, inductive reasoning is employed in sequencing the frames. The frames employing examples are presented first, these are followed by the frames depicting rules or principles generalized through the previous example frames. Editing of the programme The first draft of the programme developed in the form of sequenced frames is subjected to a thorough review and editing process. This work is done at the following three levels in a hierarchical order: 1. Technical accuracy editing 2. Programme technique editing 3. Composition editing 55
In technical accuracy editing, the programme is thoroughly reviewed for the purpose of removing any technical inaccuracies in the subject matter. The help of some subject experts and the audio-visual or methodology experts may be taken for this purpose. The programme technique editing is performed with the help of some experts in the field of programmed instruction, for removing any deficiency and inaccuracy in the technique of programme development including designing and sequencing of the frames, style and format of programming, and so on. In compositing editing, the help is taken from some language expert to remove any inaccuracy and weakness from the language and composition point of view such as grammatical mistakes, spelling errors, inappropriateness of the language, and punctuation forms. The language of the instructions given to the learners in the programme shouldalso be checked and, similarly, the other important aspects such as length of the blanks, uniformity of the numbering system, placement of example and illustrations also should be thoroughly checked as to remove any discrepancies from the point of view of composition. 3)
Evaluative Phase The last phase of the development of the programmed instruction material, evaluative phase, is related with the try-out and evaluation of the edited programmed material available in the form of sequenced frame. With the help of activities undertaken in this phase, the programmer tries to test the efficiency and effectiveness of his programme and in the light of its results; he further tries to bring proper modification and improvement in his programme. The main activities undertaken in this phase are: (i) Individual try-out, (ii) Small group try-out, (iii) Field try-out or testing, and (iv) Evaluation.
a)
Individual try-out In this, the programme is administered to a few learners, say four (representatives of whom the programme is written) by taking them out at a time. In practice, the learner is presented with the material of the frames one by one, and asked to write down his responses on a separate sheet of paper, and then tally them with the correct responses written on the back page of the frames. The learner is clearly told that he is not going to be tested but his help is being sought in the modification of the programme. Therefore, he has to provide free and frank suggestions for improving the content, sequences or organization of the frames. Here the information face-to-face contact with a single learner, at a time, provides a valuable opportunity to the programmer to study the reactions of the learner regarding the difficulties he faced and the inadequacies of the programme. Consequently, based on the results of the tryout at individual level, the programmer tries to bring necessary improvement and modifications in the draft of the programme. 56
b) Small group try-out The modified programmed instruction draft (on the basis of the individual try-out is then tried on a small group of learners, say five to ten. Here, with a proper rapport and in a informal environment, the learners are persuaded to render proper help in testing the appropriateness and effectiveness of the programme. They are provided with the copy of the programme along with a blank sheet to record their responses, point out difficulties and give suggestions for modifications and improvement. The time taken in completing the programme is also carefully noted. Pre-test before proceeding on the programmed instruction and post test after completing the programme also are conducted. The differences in the attainment scores of pre- test and post-test are them employed to ascertain the effectiveness of the programme.
c)

Field try-out or testing One the basis of the finding of the small group try-out, the programmer brings necessary structural changes in the programmed draft and goes a step further for testing its validity of the field, i.e. real setting. Field testing differs from the small group try out in the sense that it represents a full and final try-out of the programme and is undertaken by the teachers and instructors instead of the programmer with the real students in real learning situations. However the method of testing is similar as practiced in small group try-out. The difference found in pre-test and post-test attainment scores of the learners, the difficulties faced, and the suggestions received and responses analyzed on the basis of findings of the field testing provide valuable cues and keys for testing the validation and appropriateness of the developed programming material. d) Evaluation The results of field try-out in the form of data are properly analyzed through the process of evaluation for testing the validity and improving the quality of the prepared programme. The validation is carried out on two fronts: one on internal criteria and the other on external criteria. Whereas the internal criteria of the evaluation is concerned with internal features strength and weaknesses of the programme, the external criteria provides support for the validation of the programme by giving evidence in favour of its effectiveness. Evaluation based on internal criteria: Here, the data of field testing may be evaluated in terms of (i) error rate, (ii) programme density, and (iii) sequence progression. In this text, we will discuss the first two, i.e. error rate and programme density (i) Evaluation in terms of error rate: The error rate is computed on the basis of the learner's responses obtainable on each frame of the programme. If the learner is not able to respond correctly on a particular frame, it is considered as an error. This task of error detection is carried out for each frame and for all the learners who are tested in the field try-out. The errors detected are then used for computing two types of error rate: (i) the error rate of the total programme or a particular unit of the programme, and (ii) the error rate of a particular frame. The formulae used for the computation of these are: 57
The interpretation of error rates in terms of the evaluation of the programme should be made very cautiously. A lower error rate does not always ensure the effectiveness of the programmes. It may be the result of an easy programme or excessive priming or prompting used in designing the frames. However, the errors, especially the higher error rate, provide red signal to the programmer for making necessary modification in the programme. (ii) Evaluation in terms of programme density: The computation of programme density helps in the measurement of the difficulty level of a programme. It is usually measured in terms of a hypothetical ration known as type token ratio (TTR). This ratio is calculated with the help of the following formula: Where Nd = the total number of different types of responses and Nt = the total number of responses required in a programme. For example, if in a particular programme, the learner is required to respond in 30 different ways out of 70 total number of responses required, its programme density can be computed as: Since TTR is a ratio, its range lies between 0 and 1. Its value signifies the relative difficulty level of the programme. If the value is one, the programme density will be the maximum. The learner will be required to respond differently to each frame of the programme and hence the programme will be termed as the most difficult. Similarly, if every response that is required of the learned consists of the same word, the programme will be termed to save minimal density. The computation of TTR, thus, can serve very useful purpose in Pointing out its difficulty level. In an ideal programme, the range of TTR is said to be between 0.25 and 0.33 and consequently, every programme should try to maintain this level of TTR in the development of the programme. Evaluative measures based on the external criteria: Under this, the programmer can evaluate his programme in terms of: (i) Criterion test, (ii) gain ratio, and (iii) learner's attitude. Let us discuss these measures one by one. (i) Evaluation in terms of criterion test: Evaluation of the levels of performance of the learners under this test is done at the preparatory stage of the programme. Its results may reveal the extent to which the behaviour potential (from entry to terminal behaviour) is raised Thus, the units or whole of the programme may be evaluated in terms of the realization of the set objectives. 58
(ii) Evaluation in terms of gain ratio: The effectiveness of a programme can properly be measured with the help of a concept known as gain ratio. It is defined as the ratio between the amount learned and the amount could be learned. For a particular programme, it can be computed with the use of the following formula: (iii) Evaluation in terms of the learner's attitude: For this purpose, the programme is required to develop and administer an attitude scale. The use of a three-point attitude scale can serve the purpose well by making the attitude-linked statements as yes, no and ? (agreeing, disagreeing, and can't say). With these attitude- demonstrable responses of the learner, the programmer can be acquainted with their reactions, liking and disliking for the content, style of programming, difficulty level, language, the design and sequencing of the frames, instructions, illustrations, and other such features of the programme. For objective evaluation, the programmer can go ahead with the task of computing the attitude coefficient with the help of the following formulas: Where, $f$yes = the total of the frequencies of responses marked as 'yes'; $f$no = the total of the frequencies of responses marked as 'no'; and f? = the total of the frequencies of responses marked as '?'.

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Computer - Assisted Instruction Meaning of Computer - Assisted Instruction: A revolutionary change in information technology has resulted in the production of innovation to simplify and ameliorate student's learning. The greatest contribution of cyber age technology is the development of computer and its use in all walks of life. Computers are fundamental for the rapid flow of information and are responsible in bringing revolution in the field of education. Use of computers in teaching-learning process has stepped many stages of its evolution. Computers have become the basis for data processing technologies used in realizing information production, manipulating, storing, and distributing processes. They reach more senses compared to other technological tools and make abstract and complicated concepts concrete digitally. Because of their extensive multimedia properties, they are considered as one of the most important technological tools and are used in educational and instructional process. Computers play an influential part in accomplishing many pedagogical functions such as measuring and evaluating knowledge and giving feedback, observing activities and performances of students. Being independent from time and environment, computers motivates the students and helps them in active participation, considers individual differences, regulates education level according to existing knowledge and progress of the students, and presents the learning instructions by using graphics, pictures, animation and sound. The computer technology has a deep impact on education. 59 Computers facilitate an efficient storage and effective presentation of information. Presentation software like Powerpoint and animation software like flash, 3D studio and others can be a great help to the teachers while delivering information.

Computers can

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turn out being a brilliant aid in teaching and making the process of learning interactive and interesting. Computer-Assisted Instruction (CAI) is among the range of strategies being used to improve student achievement in school subjects. Programs for CAI have come a very long way since they were first developed over two decades ago. These programs tutor and drill diagnose student's problems; keep records of student progress, and present material in print and other manifestations. It is believed that they reflect what good teachers do in the classroom. Computer-Assisted Instruction (CAI) is an interactive instructional method that uses a computer to present material, track learning, and direct the user to additional material, which meets the student's needs. In CAI, information presented on computers in the form of text or in multimedia formats, including photographs, videos, animation, speech, and music help in increasing active participation of the students in teaching-learning process. Computers help students in visualizing abstract objects. Examples of CAI applications include guided drill and practice exercises, computer visualization of complex objects, and computer-facilitated communication between students and teachers. CAI tools, such as word processors, spreadsheets, and databases, collect, organize, analyze, and transmit information. They also facilitate communication among students, between students and instructors, and beyond the classroom to distant students, instructors, and experts. In short, Computer-Aided Instruction(CAI) or Computer-Assisted Instruction (CAI) is diverse and rapidly expanding spectrum of computer technologies that assist the teaching-learning process. Definitions of Computer-Assisted Instruction: Locatis and Atkinson (1984) describe Computer-assisted instruction as a mode of instruction that involves student's interaction with the computer directly. Typically, students access program presented in segments, with each segment

including information

and questions or problems for student's response. The correctness of each response is indicated immediately and remedial or new information is presented. Sometimes students also have the option to requesting help or skipping ahead. Although this tutorial (information-practice-feedback) form of CAI is most typical, there are other forms such as drill and practice exercise, simulations and games. Computer-Assisted Instruction is described and defined by Frenzel (1986) as the process by which written and visual information is presented in a logical sequence to a student by a computer. The computer serves as an audio-visual device. The students learn by reading the material presented or by observing the graphic information displayed. The primary advantage of the computer over other audiovisual devices is the automatic interaction and feedback that the computer can provide. Steinberg (1991) defines CAI as computer presented instruction that is individualized, interactive and guided. He is of the view that CAI is not a method of instruction. Many methods are implemented in it, including direct and exploratory lessons, drill, games and simulations. 60 Poole (1995) defined computer-assisted instruction as a computer-based system designed to help students learn subject matter of all kind. According to Munden (1996) computer assisted instruction is an educational medium in which instructional content or activities are delivered by a computer. Students learn by interaction with the computer and appropriate feedback is provided. Roblyer and Edwards (2000) defines CAI as software designed to help teach information and /or skills related to a topic also known as courseware. All the definitions of computer assisted instruction presented above agree that computer plays a role of tutor and imparts instructions either through tutorials or simulations or any other mode of presentation. Use of computer in education is referred by many names such as: • Computer Assisted Instruction (CAI) • Computer aided Instruction (CAI) • Computer Assisted Learning (CAL) • Computer Based Education (CBE) • Computer Based Teaching (CBT) • Computer Based Instruction (CBI) • Computer Enriched Instruction (CEI) • Computer Managed Instruction (CMI) Computer-Assisted Instruction (CAI) or Computer-Aided Instruction (CAI) is a narrower term and most often refers to drill-and-practice, tutorial, or simulation activities. It is one of the components of computer based training (CBT). Computer- Managed Instruction (CMI) is an instructional strategy whereby the computer is used to provide learning objectives, learning resources, record keeping, progress tracking, and assessment of learner performance. Computer based tools and applications are used to assist the teacher or school administrator in the management of the learner and instructional process. CBT contains the following three components:- • Computer Assisted Instruction (CAI) • Computer Managed Instruction (CMI) • Computer Supported Learning Resources (CSLR) 61 The origin of Computer-Assisted Instruction The origin of Computer-Assisted Instruction traces back to early decade of twentieth century, when behavioural theories were being embedded and implicated in educational institutions. The fundamental idea of programmed self-instructional material was described in 1912 by Thorndike. The Greek philosopher Socrates is said to be the first programmer who developed a program in Geometry, which was recorded by his disciple Plato in the dialogue Meno. Socrates used to teach his followers by raising questions and leading them towards facts and insights through conversation. In the written form conversation seems to have some characteristics of linear programmed text such as: • Questions arranged so as to make the students conscious about ignorance and move towards deeper understanding • Indications to illustrate correct response • Immediate feedback • Praise for correct response According to Wang and Sleeman(1993) the origin of Computer-Assisted Instruction was traced back in 1924 where Sidney L. Pressy had invented a multiple choice items scoring machine further followed by B. F. Skinner s work to improve and expand the idea in 1950s and 1960s. " During 1960s the Computer-Assisted Instruction was developed and used at a few university military traced centers and corporation in the United States. The early efforts were designed for providing individualized interactive instruction to learners simultaneously. Computer-Assisted Instruction (CAI) is based on the principles of programme instruction. The major aim of programme instruction is to provide individualized instruction to meet the special needs of the individual learner. Computer-Assisted Instruction (CAI) is relatively a new field in which the pioneer efforts were made around 1960s. A number of large scale heavily funded Computer-Assisted Instruction (CAI) projects have been launched and implemented. Chambers and Sprecher (1983) defined CAI as “the use of computer to provide course content instruction in the form of drill and practice, tutorial and simulations”. History of Computer - Assisted Instruction Hall(1971) stated that the earliest attempts to automate instruction were initiated by Sidney Pressey in the early 1900s and by B. F. Skinner in 1954. Both Pressey and Skinner developed techniques of administering instructional materials to students through programmed text” (p. 629). The programmed text and teaching machines were very inadequate to provide a stimulating, responsive environment for students. “The obvious limitations of these devices prompted investigation of applying computers to instructional tasks”. According to (Suppes and Macken, 1978) members of the computer industry were also among the earliest to use computer-assisted instruction. In the late 1950s, the computer industry used computer-assisted instruction to train its own personnel by linking typewriters and teletypes terminals to computers. The programming language used during these training was obscure and quite hard for people to learn. Because of the complexity of the programming language, ways of simplifying such programming were explored. 62 By

1960, International Business Machines (IBM) developed the first computer-assisted author language, Course writer I. Educators were then able to directly program their curriculum ideas into the system During the 1960s the University of Illinois engaged in a computer-assisted project, PLATO (Programmed Logic for Automatic Teaching Operations), in connection with Control Data Corporation and the National Science Foundation.

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PLATO was one of the largest and most sophisticated computer systems designed for education. In 1963, a Computer-Assisted Instruction research project began at Stanford University. The Institute for Mathematical Studies in the Social Sciences (IMSSS) at Stanford University developed an instructional mathematical program for elementary students. The program was developed and tested in 1964. In 1966, IBM developed the first computer system specifically for instructional purposes, the 1500 Instructional System. The programs and systems developed in the early 1950s and 1960s used an electric typewriter or a teletype terminal through which students received information from the computer. The student, in turn, transmitted information to the computer. After the development of the 1500 Instructional System, most systems utilized television screens as the major display for students. Students fed responses to the program or system by the use of a typewriter keyboard. The use of random-access audio, playback/record capability, and random-access image projectors, all under program control, accompanied more complete instructional systems. In the early 1970s, computer-assisted instruction was being implemented in different ways. A unique computer-assisted instruction program, Computer-Assisted Remediation and Evaluation (CARE), was designed to help classroom teachers identify children with particular mental handicaps that would adversely affect their academic progress. The CARE project was a self-contained college level course. The special feature of this computer-assisted instruction program was the method of dissemination. A mobile CAI unit was driven to teachers who requested the program. By 1972, the unit served teachers in Maryland, Pennsylvania, Texas, and Washington, D.C. In 1972, the Mitre Corporation of Bedford, Massachusetts and C. Victor Bunderson and associates at Brigham Young University developed the Time-Shared; Interactive, Computer- Controlled, Information Television (TICCIT).The TICCIT combined mini-computers and television receivers in an instructional system with the display capabilities of color televisions. The aim of the TICCIT program was to provide a complete and independent alternative to entire college courses in selected subjects Suppes and Macken (1978) noted that the purpose of the TICCIT system was to use minicomputers and television technology to deliver computer- assisted lessons and educational programs in English and mathematics to community college students. The TICCIT lesson was displayed on a color television screen connected to a keyboard and a local computer where students could respond. One TICCIT system could serve 128 terminals (Kuliket al., 1980) . Rota (1981) stated the TICCIT system lessons were developed and designed by an assembled team of experts; whereas, the PLATO lessons were designed by teachers. According to Rota (1981), "The PLATO and TICCIT projects were succeeded in introducing effective computer - assisted systems into schools. Each project led to the development and reliable operation of computer systems dedicated to instruction. The PLATO system supported hundreds of active terminals, and it gave each site a powerful tool for teaching. The TICCIT system had the display capabilities of television and employed an 63 innovative instructional design. Schools accepted these systems as additional resources for promoting student learning and as a part of the approved curriculum", (p. 14). In addition, Kulik, Kulik, and Cohen (1980) stated that the evaluations of PLATO and TICCIT gave educators additional perspectives on computer-based college teaching and demonstrated that this teaching approach would be accepted in institutions of higher education as an additional resource for promoting student learning. In 1975, the Computer Curriculum Corporation (CCC) was developed to offer a large variety of courses for elementary through junior college students. The CAI system consisted of an instructional computer that provided individualized lessons to as many as 96 teletype terminals simultaneously. The computer and terminal were located at the school site, and neighbouring sites were then linked to the computer via telephone lines. According to Rota (1981), the PLATO and TICCIT systems opened the gateway in the potential of a technology market in education. Recently, the use of technology in education and classroom teaching has increased across a variety of disciplines. In many cases, the use of multimedia instruction has proved to be effective. Students may get benefits from CAI. It provides better and more comfortable learning for students, since they learn at their own pace and convenience; get opportunities to work with vastly superior materials and more sophisticated problems; personalized tutoring; automatic measurement of progress; and others. Teachers also gain from CAI, as they experience less drudgery and repetition, greater ease in updating instructional materials, more accurate appraisal

and documentation

of student progress, and more time to work directly with students With increasing advances in computer technology, computer- assisted instruction (CAI) is now seen by many as a method of providing relevant instruction to a large number of students. Researcher felt it necessary to consider important to know about the programme instruction before starting with the theoretical foundation of CAI. 64

Unit: III Emerging Trends in Educational Technology In this unit, you will learn about, • Distance Education, Open Learning System & Educational Technology • Evaluation and Educational Technology • Criteria to evaluate Educational Technology • Emerging trends in Educational Technology • Additional Emerging Technologies • Problems of New Technologies • Resource centres
for Educational Technology and their activity for improvement of
teaching
learning Distance Education, Open Learning System & Educational Technology Distance education and open learning system provide flexibility to the learners beyond four walls of formal school and college arrangement depending on their own pace, convenience beyond the constraints of time, space, caste, sex, location, religion
and
community. Distance education as a generic term used to define the field or distance learning
is a mode of delivering education and instruction, often on an individual basis, to students
who are not physically present in
a traditional setting such as a classroom. Distance learning provides "
access to learning when the source of information and the learners are separated by time and distance, or both." Distance education
courses that require a physical on-site presence for any reason (excluding taking examinations) may be referred to as hybrid or blended courses of study. Massive open online courses (MOOCs), aimed at large-scale interactive participation and open access via the web or other network technologies, are recent developments in distance education. A number of other terms (distributed learning, e-learning, online learning, etc.) are used roughly synonymously with distance education. However there lies simple difference between distance education and open learning system. “Open learning is defined as a student - centered approach to education that removes all barriers to access while providing a high degree of learner autonomy. Distance education refers to a mode of delivering a course of study in which the majority of communication between teachers and students occurs non-contiguously, and the two-way communication between teacher and student necessary for the educational process is technologically mediated. Distance education may or may not be based on open-learning ideals." (Maxwell 1995, 43) Maxwell (1995) regards open learning and distance education as two non-traditional learning approaches that might provide an option for reaching non-traditional students. He further argues that "Distance education and open learning should be recognized as two 65

distinct concepts. Distance education refers to a mode of delivery with certain characteristics that distinguish it from the campus-based mode of learning. Open learning refers to a philosophy of education providing students with as much choice and control as possible over content and learning strategies. A distance-education institution could be open or closed. An open learning course could be offered on campus or at a distance." (Maxwell 1995, 46). Atkinson (1996) argues that 'open learning' carries connotations of learning not being closed or blocked off, and so able to be more readily accessed with the opportunity to participate and succeed, while 'flexible learning' carries connotations of learning being more adaptable and versatile, so enhancing opportunities to participate and to be successful. In her opinion, openness can be seen as relating more to an outcome and flexibility to the means of achieving this outcome. The two terms appear to be two sides of the same coin. Flexibility contains dimensions of access (the opportunity to participate), timing and duration, location of study, curriculum factors, and learning support. (Atkinson 1996, 45-46). Bates (1996) defines distributed learning (DL) as "a learner-centred approach to education, which integrates a number of technologies to enable opportunities for activities and interaction in both asynchronous and real-time modes. The model is based on blending a choice of appropriate technologies with aspects of campus-based delivery, open learning systems and distance education. The approach gives instructors the flexibility to customize learning environments to meet the needs of diverse student populations, while providing both high quality and cost-effective learning." (Bates 1996, 9) Bates goes on to contend that although many people use the terms 'distributed learning' and 'distance education' interchangeably or assume that they mean the same thing, this is not the case. He gives an example of university-level courses for fully registered, on- campus students where a substantial part is available on the Web or on CD-ROM. Students can access this material at any time, from the campus or from home, which certainly makes the course more easily accessible. However, Bates remarks these students have to be 'resident', i.e., available for lectures. In this case, this is distributed learning but not distance learning nor open learning since students have to meet all the stringent entrance requirements to be registered as university students. (Bates 1996, 9-10). Wylie (1996) summarises eight characteristics of open learning: Who? (flexible entry provision), Why? (responsive to learner needs), What? (learner can negotiate content), How? (resource-based, alternative strategies), Where? (home, workplace, study centre), When? (flexible start, pace, completion times), How effective? (learner participates in assessment), Who helps? (variety of advice, support available). (Wylie, 1996, 288) The tools and software used in DE are often quite the same as in ODL, but there is a shift in emphasis from a more teacher-focused environment towards an open learner-centred and virtual learning environment with a focus on distributed expertise and cognitive tools. However it emphasizes high needs of the students with respect to the concern course in terms of teaching learning resources, teachers, curriculum , evaluation, support system, teaching 66 learning materials etc. This challenging situation can be balanced through educational technology and their tools. Although the expansion of the Internet blurs the boundaries, distance education technologies are divided into two modes of delivery: synchronous learning and asynchronous learning. In synchronous learning, all participants are "present" at the same time. In this regard, it resembles traditional classroom teaching methods despite the participants being located remotely. It requires a timetable to be organized. Web conferencing, video conferencing, educational television, instructional television are examples of synchronous technology, as are direct-broadcast satellite (DBS), internet radio, live streaming, telephone, and web - based VoIP. [30] Web conferencing software such as Adobe Connect help to facilitate meetings in distance learning courses and usually contain additional interaction tools such as text chat, position, hand raising, emotions etc. These tools also support asynchronous participation by students being able to listen to recordings of synchronous sessions. Immersive environments (notably
Second Life)

have also been used to enhance participant presence in distance education courses. Another form of synchronous learning that has been entering the classroom over the last couple of years is the use of robot proxies including those that allow sick students to attend classes. In asynchronous learning, participants access course materials flexibly on their own schedules. Students are not required to be together at the same time. Mail correspondence, which is the oldest form of distance education, is an asynchronous delivery technology, as are message board forums, e-mail, video and audio recordings, print materials, voicemail, and fax. The two methods can be combined. Many courses offered by both open universities and an increasing number of campus based institutions use periodic sessions of residential or day teaching to supplement the sessions delivered at a distance.This type of mixed distance and campus based education has recently come to called "blended learning" or less often "hybrid learning". Many open universities uses a blend of technologies and a blend of learning modalities (face-to-face, distance, and hybrid) all under the rubric of "distance learning." Distance learning can also use interactive radio instruction (IRI), interactive audio instruction (IAI), online virtual worlds, digital games, webinars, and webcasts, all of which are referred to as e- Learning. Media psychology and media studies have evolved as research focii in the study of media effects. Each has grown into important academic areas with graduate degree programs now providing professional research, teaching and field staff to help build understanding of the behavioural implications of media. The first MA, PhD and EdD programs in Media Psychology and Media Studies were launched in 2002 by Bernard Luskin at Fielding Graduate University. Distance education usually has two forms: 1. the learner operates independently and 2. classroom instruction is accompanied by distance learning (California Distance Learning Project (CDLP), 2005). Either way, there is an overlap in terms of both technologies and media. The important elements are technological transmissions and the media applications. The importance of transmitting instructional materials to distant learner through print, audio and video media, and to deliver messages have always been stressed (Chung, 1991). These 67
technologies and media can be applied in both traditional and modern forms of distance educational systems in higher education in any country.
Evaluation and
Educational Technology Educational technology is an emerging trend that has been growing rapidly in the field of school and college education. Many new researches have been supplementing new techniques toi this field for flourishing this new field. However it is really required to explore how far these technological tools are able to achieve the instructional objectives properly. For this there is a need to evaluate instructional technology with proper criteria and strategy. Evaluation uses the information from monitoring to analyse the process, programs and projects to determine if there are opportunities for changes to the strategy, programs and projects. Evaluation, like monitoring, should promote learning. Evaluation of teaching/learning software consists of two types: 1) Formative 2) Summative Formative evaluation is done in a continuous process during the development of educational media courseware. Formative evaluation helps in taking decision regarding the inputs in the educational technology material development. Summative Evaluation is another type of evaluation in educational technology. After the completion of the development of educational technology media in software or hardware form the courseware is released for use. The actual user then make suggestions and these suggestions form the basis of summative evaluation. Rubrics can also be used to evaluate software and technology based upon specified criteria (e.g., cost effectiveness, age appropriateness, curricular relevance, etc.). The rubrics presented for evaluating software and Web sites are very useful and are appropriate for both you and your students to use. As noted, most schools and/or districts have a group of people who evaluate software prior to making a purchase. Teachers also need to evaluate software before attempting to integrate it in the curriculum. It is always important to evaluate software for content and age appropriateness. This follows with the idea of not letting the technology drive the curriculum, but letting your curriculum and learning objectives drive the technology. By evaluating software you will be able to make better decisions about what and how to effectively integrate a particular piece of software. Evaluation of educational technology is important before, during, and after instruction takes place. Evaluation after instruction is a crucial component of a lesson that effectively utilizes technology and digital media. Teachers can rely on a variety of resources to help evaluate the appropriateness of educational technologies. Depending on the nature of the evaluation you conduct, evaluation satisfies different goals such as: 1. To Improve the multimedia product: Improving your multimedia educational material is an overarching goal of evaluation. We work under the assumption that a product is never perfect, but that it is nevertheless good enough that it can be revised in order to be used again when you go through the next iteration 68

of the multimedia development cycle. Evaluating in order to make improvements is known as formative evaluation. Even if you can be absolutely sure that the multimedia educational product will not be used again after it has been deployed, going through the evaluation process allows you to refine your critical stance towards the multimedia products that you develop in the future. 2. To help assess the effectiveness of instructional Material: Judging the effectiveness of your instruction is known as summative evaluation. If the multimedia materials form but one component of an educational intervention strategy, a summative evaluation of your multimedia educational materials can be a part of the larger goal of assessing the effectiveness of the educational intervention. 3. To improve your Skills or the skills of your team in instructional media development: Knowing where you did a good job and where you didn't do as well, and why, are key to your personal development as an instructional designer. 4. To improve the multimedia development process: The multimedia development process is an idiosyncratic one; the type of clients that you attract, the personalities and abilities of the people in your team, the professional experience you and your team possess, and the resources that are available to you all affect the development process. No development process template can replace repeated and informed experimentation with developing multimedia educational materials. 5. To Comply with requirements: One reason that you conduct evaluation is that you have been required to, either by some regulatory body or by your client. One variation of evaluating because of compliance is evaluating instructional multimedia materials to see if they comply with standards. Standards- based evaluation is covered later. 6. To contribute to knowledge of evaluation Theories and Practices: It is possible that in the process of trying to design your monitoring and evaluation tools, you come up with new and useful theories and practices on educational technology; in this case, you could provide a great deal of benefit to a great number of people if you share your insights to a community of like-minded professionals! Criteria to evaluate Educational Technology Students, instruction, process Evaluating your multimedia educational materials ultimately is the process of engaging not just with the question, "How well did the students learn?" but also with the question, "How much of the students' learning is due to the multimedia educational materials you've created?" 1. Cost The material of educational technology should be evaluated on the basis of its cost effectiveness. 69

2. Usability - usefulness Usefulness • Usefulness is related to pedagogical effectiveness, cognitive efficiency, and appeal. • Users can learn from their interactions with useful multimedia material. • To be useful, multimedia material has to be usable in the first place. Usability • Usability is related to functional correctness, perceptual efficiency, and technological efficiency. • User can perceive, view, interact with, and navigate usable multimedia material. • Usability is more basic than usefulness. If something is not usable, it is guaranteed not to be useful 3. Content • Content is current. • Content is accurate. • Content supports curriculum. • Scope (range) and depth of topics are appropriate to student needs. • Material has significant illustration, example, references. • The level of difficulty is appropriate for the intended audience. • Content integrates “real-world” experiences. 4. Instructional Design Evaluation of the instructional design of the resource involves an examination of its goals, objectives, teaching strategies, and assessment provisions. Evaluators should begin with the instructional objectives and work through the methodology. The following items should be judged on their contribution to the overall objectives of the resource. • Instructional goals and learner objectives are clearly stated. • The resource is suitable for a wide range of learning/teaching styles. • The resource promotes student engagement. • The methodology promotes active learning. • The methodology promotes development of communication skills. • The resource encourages group interaction. • The resource encourages student creativity. • The resource allows/encourages student to work independently. • The resource is suitable for its intended purpose. • Materials are well organized and structured • Materials have unity/congruency. • Concepts are clearly introduced. • Concepts are clearly developed. • Concepts are clearly summarized. • Integration across curriculum subjects is supported. • Non-technical vocabulary is appropriate. • Technical terms are consistently explained/introduced. • Pedagogy is innovative. 70

• Adequate/appropriate pre-teaching and follow-up activities are provided. • Adequate/appropriate assessment/evaluation tools are provided. 5. Technical Design • Appropriate support materials are provided. • Visual design is interesting/effective. • Illustrations/visuals are effective/appropriate. • Character size/typeface is appropriate. • Layout is logical and consistent. • Users can easily employ the resource. • Packaging/design is suitable for the classroom/library. • The resource makes effective use of various mediums. 6. Social Considerations • Gender/Sexual Roles Any portrayal of gender issues in approved resources should be relevant to the curriculum for which the resource is being considered, and appropriate for the age level of the intended audience. • Sexual Orientation Resources should reflect positive awareness and sensitivity in the portrayal of diverse sexual orientations. Any reference to sexual orientation should be in the context of the curriculum for which the resource is being considered, and appropriate to the age level of the audience. • Belief Systems A belief system is an organized set of doctrines or ideas (philosophy, religion, political ideology). Approved resources should neither overstate nor denigrate any belief system. • Age Resources should portray different age groups, and reflect society's treatment of them. • Socio-Economic Status Resources should address socio-economic issues, including biases,values, and perspectives related to income. • Political Bias Resources should avoid political bias (e.g., no one political point of view should be advocated over any other). Some topics may be particularly sensitive (e.g., land use, elections, environment, agricultural practices). • Regional Bias Approved resources should not exclude one geographical region in favour of another exploration and settlement of one regional area). • Multiculturalism (and anti-racism) The perspective from which information is presented in resources is important. It is not sufficient to merely include in texts or videos pictures of multicultural people • Special Needs The effective promotion of awareness of the capabilities and contributions of children and adults with special needs is important. Their integration into education as fullfledged, respected, participating members of society is desirable. It is also of note that students with special needs have diverse backgrounds. These additional diversities and challenges need to be acknowledged. 71
• Ethical/legal Issues Issues subject to debate on moral or legal grounds should be examined closely, considering accuracy and currency of data, and evaluating for bias. • Language The use of specialized language should be suited to the context, maturity, and intellectual level of the audience. • Violence Incidences of violence, where present, should be suited to both the context and the maturity level of the audience. • Safety standards compliance Activities portrayed should comply with legal and community standards of complance.
Emerging trends in Educational Technology Though several traditional technological tools are used in education system as teaching learning material in this 21st century, with advancement in the field of information communication technology new trends and practices have been coming to this scenario. These new technologies are emerging and flourishing in the society with the continuous research in the fieldd of science and technology which are making teaching learning situation more simple and [leasant. Some of such technologies include technological tools like computer, mobile, tablet, smart phones etc. are as follows: 1) Video Tapes A relatively wide magnetic tape used to record visual images and associated sound for subsequent playback or broadcasting. Videotape is magnetic tape used for storing motion images and usually sound, as opposed to film or random-access digital media. Videotapes are also used for storing scientific or medical data, such as the data produced by an electrocardiogram. In most cases, a helical-scan video head rotates against the moving tape to record the data in two dimensions, because video signals have a very high bandwidth, and static heads would require extremely high tape speeds. Videotape is used in both video tape recorders (VTRs) or, more commonly and more recently, videocassette recorders (VCRs) and camcorders. Tape is a linear method of storing information, and since nearly all video recordings made nowadays are recorded to random-access media such as a hard disk or flash storage, videotape is expected to gradually lose importance as non- linear/random-access methods of storing digital video data become more common. 2) Radio Radio is the radiation (wireless transmission) of electromagnetic signals through the atmosphere or free space. The biggest use of radio waves is to carry information, such as sound, by systematically changing (modulating) some property of the radiated waves, such as their amplitude, frequency, phase, or pulse width. When radio waves strike an electrical conductor, the oscillating fields induce an alternating current in the conductor. The information in the waves can be extracted and transformed back into its original form. Radio systems need a transmitter to modulate (change) some property of the energy produced to impress a signal on it, for example using amplitude modulation, angle modulation (which can be frequency modulation or phase modulation). Radio systems also need an antenna to convert electric currents into radio waves, and vice versa. An antenna can 72

be used for both transmitting and receiving. The electrical resonance of tuned circuits in radios allow individual stations to be selected. The electromagnetic wave is intercepted by a tuned receiving antenna. A radio receiver receives its input from an antenna and converts it into a form usable for the consumer, such as sound, pictures, digital data, measurement values, navigational positions, etc. Radio frequencies occupy the range from a 3 kHz to 300 GHz, although commercially important uses of radio use only a small part of this spectrum. A radio communication system sends signals by radio. The radio equipment involved in communication systems includes a transmitter and a receiver, each having an antenna and appropriate terminal equipment such as a microphone at the transmitter and a loudspeaker at the receiver in the case of a voice-communication system. Radio communication is typically in the form of AM radio or FM Radio transmissions. The broadcast of a single signal, such as a monophonic audio signal, can be done by straightforward amplitude modulation or frequency modulation. 3) TV It is An electronic broadcast system in which special providers transmit a continuous program of video content to the public or subscribers by way of antenna, cable, or satellite dish, often on multiple channels: A television (also TV, telly or tube) is a machine with a screen. Televisions receive broadcast signals and turn them into pictures and sound. The word "television" comes from the words tele (Greek for far away) and vision (seeing).Television has been given considerable importance in many countries as a source and a tool of teaching. The success stories of using television for education in many countries has negated the concept that television is basically on entertainment oriented medium and it is hostile to thoughts. Television is adaptable and can follow different approaches when used in the different educational situations. The medium is used for formal, non-formal and informal education. To support formal education, television usually function as supportive and reinforcement tool. Television can be attached with school curriculum and time tables. When systematically organized it takes the form of school broadcast. In non-formal education, television has a more specific role to play. When used as a part of multi-media communication tool, television can directly or indirectly teach the subject matter. Importance of television to communicate information, idea, skills and attitudes has been affirmed by researches. You should attempt to study various reports published on educational television in different countries in different situations. In the words of Director BBC - next to home and school I believer television to have a more profound influence on human race then any other medium of communication. If media is to work as an effective teaching tool then certainly it is helping hand towards, achieving the aim and objectives of education. Media is an agent of boost cultural economic and social development activity. Television, as an important mass medium disseminates education through formal and information methods. Television also continues to benefit the masses by making them conscious of the environment, rights, duties and privilege. It is a source of teaching etiquettes, language skills, hobbies, social relations and religious believes. Role of television is neither fixed nor easily tangible and measurable. The role is directly related to the question of how the planners are serious and determined to use television. The role could either be enormous or, on the contrary very meager depending upon 73 the specific tasks and available resources. Generally television can help to achieve the following objectives: a) Social quality in education b) Enhance quality in education c) Reduce dependency on verbal teaching and teachers d) Provide flexibility of time and space in learning. e) Stimulates learning f) Provide mass education opportunities. As far the impact of education television it should rather be studied in more narrow and specific areas. In the world of scram; TV is more effective in teaching mathematics, science and social studies. Where as history, humanities, and literature has not benefited from this medium the same degree. The impact of television on macro level should be studied in three areas namely; i) Teacher's Competencies ii) Student's Competencies iii) Effects on general viewers Television programs may be transmitted either "live" or from a recording. The principle means of recording television programs for future use is videotape recording. When a television program is broadcast, the varying electrical signals are then amplified and used to modulate a carrier wave (see modulation); the modulated carrier is usually fed to an antenna, where it is converted to electromagnetic waves and broadcast over a large region. The waves are sensed by antennas connected to television receivers. The range of waves suitable for radio and television transmission is divided into channels, which are assigned to broadcast companies or services. Elements of Broadcast Television There are a several major parts that are required in order to receive television broadcasts. They include an image source, a sound source, a transmitter, a receiver, a display device, and a sound device. Image Source The image source can be defined as the program. It can be a movie, TV show, news program, etc. The image source is just the source's video and does not include the sound. The image source is usually recorded on camera or flying spot scanner. 74

Sound Source: Once the image source is obtained in the form of movie, sound it is needed to complete a medium. The sound source is the TV programme's audio signal whether coming from movie, TV show, news programme. It cab n come in the mono, stereo or even digitally processed surround sound. Transmitter A transmitter is what sends both audio and video signals over the air waves. Transmitters usually transmit more than one signal (TV channel) at a time. A transmitter modulates both picture and sound into one signal then sends this transmission over a wide range for a receiver (TV set) to receive. Receiver A receiver (TV set) receives the transmitted signals (TV programs) and turns radio waves, which include audio and video signals, into useful signals that can be processed into an image and sound. Display Device This is either a TV set or monitor. A display device has the technology to turn the electrical signals received into visible light. On a standard TV set, this includes the CRT (Cathode Ray Tube) technology. Sound Device The sound devices are usually speakers that are either built into the TV set or that accompany the TV set and turn electrical signals into sound waves to play audio along with the video images. Broadcast Television Signals Broadcast Television Signals are video and sound signals that are transmitted over the air. Anyone using a television set that has a receiver and an antenna can pick them up for free. Antennas are used to grab as much signal as possible and to sometimes amplify the signal. All TV sets have the ability to switch the receiver's tuner to pick up specific channels. Each channel is transmitted on its own frequency, which the TV set can tune into and receive. 75

Broadcast TV vs. Satellite TV and Cable TV There are three main ways to receive TV programming, one is through broadcast television and the other two are through satellite and cable TV. Broadcast TV Broadcast TV is when audio and video signals are transmitted over the air waves from a ground based transmitter. These signals are usually picked up for free and are on specific frequency spectra. Satellite TV Satellite TV is usually a digital TV signal that is broadcast from a satellite orbiting the earth. They are usually pay services that require special equipment to receive programming and operate on special frequencies. Cable TV Cable TV is a pay TV service that sends out signals not over the air, but through cable that runs from the cable company to the viewer's home. Many cable types, from copper to fiber optic cables, are used. The signal can be analog or digital. 4)

Teleconferencing Teleconferencing means meeting through a telecommunications medium.

It is a generic term for linking people between two or more locations by electronics.

There are at least six types of teleconferencing: audio, audiographic, computer, video, business television (BTV), and distance education.

The methods used differ in the technology, but

common factors contribute to the shared definition of teleconferencing: • Use a telecommunications channel • Link people at multiple locations • Interactive to provide two-way communications • Dynamic to require users' active participation

a)

98% MATCHING BLOCK 76/77 W

Interactive Technologies The new systems have varying degrees of interactivity - the capability to talk back to the user. They are enabling and satellites, computers, teletext, view data, cassettes, cable, and videodiscs all fit the same emerging pattern. They provide ways for individuals to step out of the mass audiences and take an active role in the process by which information is transmitted. The new technologies are de-massified so that a special message can be exchanged with each individual in a large audience. They are the opposite to mass media and shift control to the user. Many ae asynchronous and can send or receive a message at a time convenient for individuals without being in communication at the same time. This overcomes time as a variable affecting communication. A video, data and voice delivery system reduces travel costs. When the material is retrieved and saved to a video tape or disc, the material can be used at anytime or anyplace. As more interactive technologies emerge, the value of being an independent learner will increase. Research shows that learning from new technologies is as effective as traditional methods. Large groups are cost-effective and everyone gets the same information. 76 b) Types of Teleconferences 1) Audio Teleconference: Voice-only; sometimes called conference calling. Interactively links people in remote locations via telephone lines. Audio bridges tie all lines together. Meetings can be conducted via audio conference. Preplanning is necessary which includes naming a chair, setting an agenda, and providing printed materials to participants ahead of time so that they can be reviewed. Distance learning can be conducted by audio conference. In fact, it is one of the most underutilized, yet cost effective methods available to education. Instructors should receive training on how to best utilize audio conferences to augment other forms of distance learning. 2) Audio graphics Teleconference: Uses narrowband telecommunications channels to transmit visual information such as graphics, alpha-numerics, documents, and video pictures as an adjunct to voice communication. Other terms are desk-top computer conferencing and enhanced audio. Devices include electronic tablets/boards, freeze-frame video terminals, integrated graphics systems (as part of personal computers), Fax, remote-access microfiche and slide projectors, optical graphic scanners, and voice/data terminals. Audiographics can be used for meetings and distance learning. 3) Computer Teleconference: Uses telephone lines to connect two or more computers and modems. Anything that can be done on a computer can be sent over the lines. It can be synchronous or asynchronous. An example of an asychronous mode is electronic mail. Using electronic mail (E-Mail), memos, reports, updates, newsletters can be sent to anyone on the local area network (LAN) or wide area network (WAN). Items generated on computer which are normally printed and then sent by facsimile can be sent by E-Mail. Computer conferencing is an emerging area for distance education. Some institutions offer credit programs completely by computer. Students receive texts and workbooks via mail. Through common files assigned to a class which each student can assess, teachers upload syllabi, lectures, grades and remarks. Students download these files, compose their assignment and remarks offline, then upload them to the common files. Students and instructors are usually required to log on for a prescribed number of days during the week. Interaction is a large component of the students' grades. Through computers, faculty, students and administrators have easy access to one another as well as access to database resources provided through libraries. The academic resources of libraries and special resources can be accessed such as OCLC, ERIC, and Internet. Administrators can access student files, retrieve institutional information from central repositories such as district or system offices, government agencies, or communicate with one another. Other resources can be created such as updates on state or federal legislation. 4) Video Teleconference: Combines audio and video to provide voice communications and video images. Can be one-way video/two-way audio, or two-way video/two-way audio. It can display anything that can be captured by a TV camera. The advantage is the capability to display moving images. In two-way audio/video systems, a common application is to show people which creates a social presence that resembles face-to-face meetings and classes and enables participants to see the facial expressions and physical demeanor of participants at 77 remote sites. Graphics are used to enhance understanding. There are three basic systems: freeze frame, compressed, and full-motion video. Video conferencing is an effective way to use one teacher who teaches to a number of sites. It is very cost effective for classes which may have a small number of students enrolled at each site. In many cases, video conferencing enables the institution or a group of institutions to provide courses which would be cancelled due to low enrollment or which could not be supported otherwise because of the cost of providing an instructor in an unusual subject area. Rural areas benefit particularly from classes provided through video conferencing when they work with a larger metropolitan institution that has full-time faculty. Through teleconferencing, institutions are able to serve all students equitably. Why Use a Teleconference?

Video conferencing

increases efficiency and results in a more profitable use of limited resources. It is a very personal medium for human issues where face-to-face communications are necessary. When you can see and hear the person you are talking to on a television monitor, they respond as though you were in the same room together. It is an effective alternative to travel which can easily add up to weeks of non-productive time each year. With
video conferencing,
you never have to leave the office. Documents are available, and experts can be on hand. A crisis that might take on major proportions if you are out of town, can be handled because you're on the job.
Video conferencing
maximizes efficiency because it provides a way to meet with several groups in different locations, at the same time. As the limited resource of funding has decreased, limited resources now include instructors, parking spaces and buildings. Students now include time as a limited resources. Teleconferencing enables institutions to share facilities and instructors which will increase our ability to serve students. Move Information - Not People Electronic delivery is more efficient than physically moving people to a site, whether it is a faculty member or administrator. Save Time: Content presented by one or many sources is received in many places simultaneously and instantly. Travel is reduced resulting in more productive time. Communication is improved and meetings are more efficient. It adds a competitive edge that\ face-to-face meetings do not. Lower Costs: Costs (travel, meals, lodging) are reduced by keeping employees in the office, speeding up product development cycles, improving performance through frequent meetings with timely information. Accessible: Through any origination site in the world. Larger Audiences: More people can attend. The larger the audience, the lower the cost per person. Larger Audiences: More people can attend. The larger the audience, the lower cost per person. Adaptable: Useful for business, associations, hospitals, and institutions to discuss, inform, train, educate or present. 78 Flexible: With a remote receive or transmit truck, a transmit or receive site can be located anywhere. Security: Signals can be encrypted (scrambled) when it is necessary. Encryption prevents outside viewers. Unity: Provides a shared sense of identity. People feel more a part of the group...more often. Individuals or groups at multiple locations can be linked frequently. Timely: For time-critical information, sites can be linked quickly. An audio or point-to-point teleconference can be convened in three minutes. Interactive: Dynamic; requires the user's active participation. It enhances personal communication. When used well for learning, the interactivity will enhance the learning and the teaching experience. 5) CCTV Closed-circuit television (CCTV), also known as video surveillance, is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point (P2P), point to multipoint, or mesh wireless links. CCTV can serve multiple purposes when utilized by the educational sector. First and foremost, CCTV can provide security services for educational buildings, guarding the technology and premises from outsiders who have intentions to harm the children, steal costly technology or vandalize school property. CCTV can also protect from threats inside the school, such as proving or disproving accusations of sexual abuse, bullying from other children, or theft from teachers or staff. More recently, CCTV has been put to work as a direct educational tool, being used as a vessel to funnel distance learning to remote areas or to non-traditional learners. It is often a significant tool for teacher training process. 6)
CAI "
Computer-assisted instruction" (CAI) refers to instruction or remediation
presented on a computer.
Many educational computer programs are available online and from computer stores and textbook companies. They enhance teacher instruction in several ways. Computer programs are interactive and can illustrate a concept through attractive animation, sound, and demonstration. They
allow students to progress at their own pace and work individually
or problem solve
in
a group. Computers provide immediate feedback, letting students know whether their answer is correct. If the answer is not correct, the program shows students how to correctly answer the question.
Computers offer a different type of activity and a change of pace from teacher-led or group instruction.
Computer-assisted
instruction
improves instruction for students with disabilities because students receive immediate feedback and do not continue to practice the wrong skills. Computers capture the students' attention because the programs are interactive and engage the students' spirit of competitiveness to increase their scores.
Also, computer-assisted instruction moves at the students' pace and usually does not move ahead until they have mastered the skill.
Programs provide differentiated lessons to challenge students who are at risk, average, or gifted. 79
7)

INSAT INSAT or the Indian National Satellite System is a series of multipurpose geo-stationary satellites launched by ISRO to satisfy the telecommunications, broadcasting, meteorology, and search and rescue operations. Commissioned in 1983, INSAT is the largest domestic communication system in the Asia Pacific Region. It is a joint venture of the Department of Space, Department of Telecommunications, India Meteorological Department, All India Radio and Doordarshan. The overall coordination and management of INSAT system rests with the Secretary-level INSAT Coordination Committee. INSAT satellites provide transponders in various bands (C, S, Extended C and K u) to serve the television and communication needs of India. Some of the satellites also have the Very High Resolution Radiometer (VHRR), CCD cameras for metrological imaging. The satellites also incorporate transponder(s) for receiving distress alert signals for search and rescue missions in the South Asian and Indian Ocean Region, as ISRO is a member of the Cospas-Sarsat programme. The Indian National Satellite (INSAT) system was commissioned with the launch of INSAT-1B in August 1983 (INSAT-1A, the first satellite was launched in April 1982 but could not fulfil the mission). INSAT system ushered in a revolution in India's television and radio broadcasting telecommunications and meteorological sectors. It enabled the rapid expansion of TV and modern telecommunication facilities to even the remote areas and off-shore islands. Together, the system provides transponders in C, Extended C and K u bands for a variety of communication services. Some of the INSATs also carry instruments for meteorological observation and data for providing meteorological services. KALPANA-1 is an exclusive meteorological satellite. The satellites are monitored and controlled by Master Control Facilities that exist in Hassan and Bhopal. INSAT 3E is a defunct communication satellite built by Indian Space Research Organisation. It was launched on September 28, 2003 from the European Space Agency's spaceport in French Guiana on board the Ariane rocket. The satellite had a launch mass of 2750 kilograms. It is the 4th satellite launched in the INSAT-3 series of ISRO.It was designed for providing high-speed communication, Television, VSAT & Teleeducation services and was an important landmark in Indian Space Programme. the government of India developed a plan of operation for the utilization of television and other facilities under the INSAT series and with the installation of high power and low power transmitters (HPTs and LPTs) in the country. The INSAT for education project began in October 1983 with the transmission of educational television programmes for children in the age group 5- 11 years. This coverage was initially meant for clusters of villages in six states: Andhra Pradesh, Bihar, Uttar Pradesh, which came to be known as the INSAT states. In 1986 and 1987, the transmission was increased to cover the entire six states and all the Hindi speaking states of the country with the help of INSAT-1B, HPTs and LPTs. At present ETV programmes are telecast in several languages including Hindi, Gujarati, Marathi, Oriya and Telugu. These ETV programmes are relayed by all HPTs and LPTs in the six INSAT states and other Hindi speaking states. These programmes reach more than 500 million people of our population. The UGC countrywide classroom offers enrichment programmes which are not based or restricted to the syllabus. Instead, it seeks to provide new insights, to bring in new 80
findings and to take students on vicarious tours of places and laboratories that are not within their reach. Inter-relatedness of various disciplines and of development problems are stressed. It attempts to overcome the obsolescence of the syllabus and presents the latest advances in all fields, especially the newly emerging ones. The programmes include applied science and social science, Indian culture, general knowledge and career guidance. Thus, enrichment programme is meant to link academic education to the real world. The INSAT system provides a comprehensive and integrated range of services. These include domestic long distance communications, meteorological Earth observation and data relay, direct broadcast television, national radio networking, television program distribution, standard time and frequency signal dissemination services, satellite news and facsimile dissemination, mobile satellite service, satellite aided search and rescue service and cyclone warning dissemination service. Not all services are available on all satellites, but these capabilities are all available through the combined system. At present, several INSAT series satellite continues to perform well in orbit providing these vital services. 1. Broadcasting: INSAT has been a major catalyst for the rapid expansion of Television coverage in India. Radio Networking through INSAT provides a reliable high fidelity programme channels for national as well as regional networking. 2) Telecommunication: INSAT system continues to support various communication services in the country. 3) Weather Forecasting: Besides revolutionizing the telecommunication and TV broadcast scenario in our country Indian National Satellite System (INSAT) has improved the weather forecasting and is providing advance warning on disasters. 4) Disaster Warning: INSAT is also providing disaster warning to the receivers installed along the cyclone-prone East coast of the country. These disaster-warning systems have enabled evacuation of thousands of people well in advance of impending cyclones. 5) Education: The INSAT network is extensively being used for educational purpose such as countrywide classrooms conducted by the University Grants Commission for two hours every day primarily meant for the university and college students, educational television programmes broadcast in the local languages for the benefit of the rural population and curriculum-based lectures broadcast by the Indira Gandhi National Open University (IGNOU). 81

6) Telemedicine: Telemedicine is a recent application of the satellite communications that makes specialised medical facility available to the remote areas of the country. The expert consultancy could be obtained for the patients in remote areas from specialists in speciality hospitals in cities. Additional Emerging Technologies Some of the additional technologies are: a)
iPads:
iPads have replaced Kindles as the preferred hand-held gadget, but it's not just about novelty. iPads have proven to be effective learning devices that allow students to interact with their lessons and teachers to constantly stream and direct students toward constantly updated information. As teacher-designed applications become the norm, iPad (and other Apple devices) will also foster customized learning so that educators can tailor their lessons to their class' performance and potential. Other benefits of the iPad in elementary education: more social interaction during learning, better mobility, focused learning, and special needs accommodation.
b) Ebooks: Even some libraries are starting to offer e-books
alongside the card catalogs, and Arnold Schwarzenegger recently pledged to use more
e-books
to combat the loss in funding for California schools. Textbooks will be easily updated in electronic form, which is much cheaper for school districts, and some e-books and digital texts can be accessed as apps for iPhones and other devices.
c) Innovative funding programs: Despite harsh budget cuts across the country, parents and teachers are fighting to keep technology a stable, progressive learning tool in schools. One middle school in Pollock Pines, CA, has organized a task force to find alternative sources of funding for technology programs and supplies, and other schools are being inspired to create innovative funding programs, too. As the trend continues, schools will be less reliant on governments and public funds, and can benefit from other sources of technology — income. This system could lead to unfair and unbalanced budgets, if lower- income schools can't pull together the same resources. d) Training teachers to become online educators: High schoolers are experimenting with online learning, and the trend is becoming so popular, it's starting to filter down to elementary and middle schools, too. As a result, teachers need training in online education so that they can transfer their classroom management skills to online environments, effectively communicating lessons and evaluating student performance. e) Interactive whiteboards: Teachers with projection screens (or just a clean whiteboard) can connect their computer so that their desktop is displayed in front of the classroom, like a chalkboard. When teachers visit interactive websites or software programs - particularly ones with touch-key or touch-based features, students can all at once interact with the lesson or game, without needing their own computers. 82
f) Virtual Reality: Virtual reality isn't just an after-school game for kids who like computers. Second Life and other VR sites and platforms offer immense learning opportunities in real-life skills, and can even introduce students to other classrooms who - play in the same space. This North Carolina elementary class wanted to experiment with math, science and art lessons through virtual reality, and they actually designed their own virtual labs.
Students
can work in virtual laboratory, can play on line educational games or participate in simulations.
g)
Blackboard and online communities: Online education platforms like Blackboard have been used by college professors for years, but they're now being used more frequently in elementary and secondary classrooms, too. These communities allow for connection between teachers, parents and students, during the school day and after hours. Grades, assignments, supplemental readings, games, chats and all types of resources can be shared easily this way, fueling multi-way communication and collaboration.
h)

Mobile technology: These days, iPods, cell phones and smart phones, iPads, and other mobile devices are quickly becoming sought-after educational tools, even in elementary classrooms. They can be used for research, one-to-one computing, e-mailing assignments, sharing information, taking pictures for projects and research, and using drawing tools, as Keller, TX, teacher Matt Cook has demonstrated. He's worked with Verizon Wireless and other corporate sponsors to give phones to his fifth graders. i) Podcasting: Podcasts are great tools for elementary teachers, because they're free and give students instant access to multimedia learning experiences from all over the world. From current events to language lessons with pronunciation assistance to science research to literature discussions to interviews with industry experts, podcasts enrich lessons in ways that help students understand the real-life implications of what they're learning. A great alternative to showing slideshows and even movies, podcasts can stir up class discussion and even inspire classrooms to create their own podcast. h) Moodle: Moodle is gaining traction in classrooms at all levels for its streamlined organization features. Teachers and administrators can easily communicate and design courses, and students can manage their own e-mail accounts, assignments, and more. Other great features include multimedia playlists and capabilities, RSS feeds, grading and assignment rubrics, ePortfolios, and personalized certificates. Problems of New Technologies Technology has been used in most schools, but it still has some hiccups. We weigh in on some of the most problematic issues facing the edtech world today. 1) Cheating: Students are so quick to turn to the Internet to answer questions that some believe critical thinking has gone down the tube. Spelling is no longer something tested if everything is autocorrected and spell checked. This may be a larger issue of technology on our memory and brain-strength, but if we are using the Internet in schools, then kids are being taught to use Google to answer all their questions and to essentially, copy and paste their knowledge. Education needs to figure out how to use technology in a way that doesn't replace knowledge, but reinforces it. 83
2) Difficulty in Handling and Managing ET on the part of Students: When using the computer and all its glitches to create a project that requires hours of work, it sometimes gets erased, doesn't transfer over correctly, doesn't save, or for one human error or another is gone. Many technology rookies have been in this position and curse at the computer that has stolen hours. Some students struggle simply to complete work that it seems unfair to put obstacles in their way, especially when some students may not have programs or the technology at home to become familiar with it. The problem with technology glitches is also seen with online textbooks. Some students have issues accessing textbooks at home if they don't have a large enough bandwidth. Other access problems to online materials can delay students and put them behind in class.
Resource centres for Educational Technology and their activity for improvement of teaching learning There are several institutions working for designing, developing, researching at state, national, international level for the promotion of educational technology. These institutes are mainly focusing on the use
of
educational technology based material for the improvement of teaching learning. These centers are thus known as resource centers of Educational Technology. Some of the significant resource centers of educational technology are as follows:
a)
CIET
Central Institute of Educational Technology, a constituent unit of NCERT, came into existence in the year 1984 with the merger of Centre for Educational Technology and Department of Teaching Aids.
It
is a premier Institute of Educational Technology
at the national level.
Its major aim is
top romote
utilization of educational technologies viz., radio, TV, satellite communications and cyber media either separately or in combinations
and its appropriate use to enhance learning and improve productivity in classrooms and schools.
The Institute undertakes various
activities to widen educational opportunities promote equity and improve quality of educational processes at
the school level.
Role and Functions
of the Institute: The broad areas of activities of CIET are listed below: 1. To design and produce media software materials viz., television/ radio (for both broadcast as well as non-broadcast use) film, graphics and other programs for strengthening the transaction of curricular and co-curricular activities at the school level. 2. To create competencies

in development and use of educational software materials through training in areas such as script development., media production, media communication, media research, technical operations, setting up studios, repair and maintenance of equipment. 3. To
develop plans for the use of Information and Communication Technologies in education. 4. To train the faculty of IASE/CTE & DIETs in the use of Educational Technology in their teacher education programs. 5. To undertake research, evaluation and monitoring of the systems, programs and materials with a view to improving the materials and increasing their effectiveness. 84
6. To document and disseminate information, materials and media programs for better utilization. 7.
To advise and coordinate the academic and technical programs and activities of the State Institutes of Educational Technology (
SIETs)
set up by the MHRD in six states of India. 8.
To design and produce media software especially mass media viz., educational radio and television; interactive multimedia and web based learning resources utilizing ICT to enrich the transactions of curricular activities at different levels of school education. 9. To optimize the utilization of EDUSAT communication technologies and terrestrial transmission on national channels: Doordarshan, Gyan Darshan and Gyan Vani. 10. To explore and infuse the appropriate and critical use of interactive digital content, web based communication and participatory networks. 11. To undertake research and evaluation studies for assessment of need, preparation of audience profiles; undertaking monitoring and evaluation of systems programmes and materials to improve their effectiveness; to study their impact on learning processes, development of children and teachers and efficiencies of systems. Documentation of educational media programmes and research for enhancing utilization. Dissemination of media programmes through broadcast and non-broadcast modes through the distribution of ACDs, VCDs, DVDs, multimedia CDs and the web. Organise capacity building programmes for teachers and teacher-educators in concepts and applications of techniques and technologies for improving classroom instructions and their management processes and State Institute of Educational Technology (SIET) personnel in scripting, production of media programmes, communication and media researches and technical operations.
To advise and coordinate (a) academic and technical programmes of the five State Institutes of Educational Technology (SIETs) (b) implementation of the National Policy of ICT for School Education, ICT@Schools Scheme. To provide consultancy to various organizations and individuals in the development, utilization and evaluation of educational technologies. The Focus Areas of the Institute Develop e-content, disseminate e-contents through various modes (transmission, non- transmission through NROER and sales mechanism) and integrate ICTs in teaching learning process through capacity building among teachers through blended mode. Regular
Programme/
Activities being Organised Development of e-contents (audio, video, multimedia, etc.) Training and retraining of teachers and teacher educators in Educational Technology and new ICT. Disseminate e-contents through telecast/broadcast on DD -1, Gyan Vani, Gyan Darshan channels and sales mechanism 85
Third Party Evaluation of ICT Scheme in schools of Karnataka state and UT Chandigarh Significant Activities/Works Carried out in the Recent Past • Developed ICT curriculum for students and teachers • Developed National Repository of Open Educational Resources (NROER) • Organized training programmes for teachers and teacher educators of 15 States/Uts through face to face and distance mode • Organized All India Children's Educational Audio Video Programmes, Contests and • National ICT Award for school teachers • Collaboration with International/National Organisations/Agencies, etc. • IGNOU and Doordarshan for telecast and broadcast of Audio/Video programmes HBCSE-TIFR Mumbai for creation of NROER SIETs, Viyan Prasar, CCRT, IGNCA, SCERTs for sharing of e-contents on NROER. • CEMCA for development of QAMLM and promote FOSS environment • NIC for hoisting of Websites: ncert.nic.in, ciet.nic.in, nroer.gov.in, itschools.gov.in 2)
UGC The role of University Grants Commission in promoting educational technology has been reflected in constitution pogf Consortium of Educational Commission which is a inter university center in 1993.
It
has been established with the goal of addressing the needs of Higher Education through the use of powerful medium of Television alongwith the appropriate use of emerging Information Communication Technology (ICT). Realizing the potential and power of television to act as means of Educational Knowledge dissemination, UGC started the Countrywide Classroom Programmes in the year 1984.
For production of such programmes Media Centres were set up at 6 Universities. Subsequently CEC emerged in 1993 as a nodal agency to coordinate, guide & facilitate
such Educational production at the National level.
Today 21 Media Centres are working towards achieving this goal under the umbrella of CEC.

It has following objectives: • Close coordination , facilitation
overall guidance and direction to the activities of media centers set up by UGC in various universities. •
Dissemination of educational programmes through bothy broadcast
and non broadcast modes. • Producttion of educational programmes in video and audio forms
and related support materials and setting up of related facilities for this. • Undertaking researches related to optimizing the effectiveness of the programme • Providing forum for the active involvement of academic and other scholars in the creation of adequate educational programme. • Studying, promoting
and
experimenting with new techniques/technology that will increase thew reach and effectiveness of educational communication. 3)
IGNOU
Indira Gandhi National Open University (IGNOU) was
established by an Act of Parliament in 1985 ,
has continuously striven to build an inclusive knowledge society through education
as said by the University itself. 86
But have you ever thought about how a university can use the technological resources effectively to help the masses to get connected in this modern technological world ? Well, this university is a good example to the thought we questioned. With the launch of EduSat (a satellite dedicated only to education)
on 20th September, 2004, and the establishment of the Inter-University Consortium, the University has shined in a new era of technology-enabled education in the country. All the regional centres and high enrollment study centres have been provided with
active two-way video-conferencing network connectivity, which has made it possible to transact interactive digital content. Thus, helping India to get digitalized at a faster rate. By its thoughts and aims it now successfully
serves the educational aspirations of over 3 million students in India and other countries
with distance education. It mainly aimed on ways
to provide access to higher education to all segments of the society.
It uses technological resources to help establishing distance free education by its Broadcast services like Gyan Vani, Gyan Darshan – I and so on. The students are also facilitated with SMS alerts on any notice to their importance. The IGNOU university has developed virtual classrooms or online classroom with the help of eGyanKosh. The virtual classrooms opens the door to the students who have any issues to attend the university classes. Its main activities with respect to educational technology are • To promote and dissemination of advance knowledge through sustainable Open and Distance learning system, • To
Strengthen the development of the National Resource Centre as a proactive role model for high-quality and learner-centric Open and Distance Learning system,? • Share professional capabilities and resources to improve standards of distance education in the country, • Periodically assess and accredit institutions of Open and Distance Learning to promote centres of excellence in the country, • Develop networks, using emerging technologies and methods, •
To meet the challenges of access
and equity, • Take education to the hitherto unreached and promote community participation for local development through life-coping skills, •
To
provide specific need-based education and training opportunities for continuous professional development and skill up gradation to in-service professionals, and • Strive towards continuous development of methods and strategies for research and development 4)
NIOS NIOS or National Institute of Open School Formerly known as National Open School. It is
an autonomous organization under MIRD and established in 1989 in pursuance of NPE 1986
which is the Largest Open Schooling System in the World. It has More than 5,00,000 learners per year and 5000 study centers . It Imparts education through distance mode through various media. NIOS is an "Open School" to cater to the needs of a heterogeneous group of learners up to pre-degree level. It was started as a project with in-built flexibilities by the Central Board of Secondary Education (CBSE) in 1979. In 1986, the National Policy on Education suggested 87 strengthening of Open School System for extending open learning facilities in a phased manner at secondary level all over the country as an independent system with its own curriculum and examination leading to certification. One of the major activities of the NIOS is to make use of modern means of Communication and Educational Technology in distance Education. Audio and Video programmes are significant components of the multi-media packages offered by NIOS for its various courses of study. The audio/video programmes supplement and complement the other modes of learning such as printed self learning materials and personal contact programmes. Activities • To take steps for developing strategy plans for promoting and up scaling the Open Schooling program in India, • To provide technical and

financial support to State Governments for setting up and up scaling of State Open Schools (SOSs), • To develop needed action plan for making education equitable and inclusive for the marginalized and disadvantaged groups like girl/women, minorities, differently- able (physically and mentally challenged) etc., • To offer courses of study in general, vocational and continuing education and life enrichment courses up to pre-degree level, • To develop need based Curricula and Self Learning Materials with focus on skill development,? • To develop multi-media and multi-channel delivery modes for effective transaction of courseware, • To provide effective student support services, • To conduct examinations and issue certificates to successful learners, • To partner with National Literacy Mission, • To promote quality of learning in ODL through Monitoring, Supervision and Evaluation, Functions of Media Unit are as follows: • Production of Audio/Video programmes for NIOS learners. • Broadcast and Telecast of Audio/Video programmes on different channels. • To produce Audio/Video Spots for publicity purposes. • To produce Multimedia programmes for NIOS learners. • Duplication of Audio/Video programmes to Audio CDs, VCDs etc., to enrich and reinforce the subject matter given in the study material, provided to the NIOS learners. • Video coverage of important functions/seminars, workshops, etc. • NIOS is planning to setup a Media centre i.e. Audio and Video studio facilities for in- house productions and a Community Radio station in its H.Q. • A 24 X 7 Educational Channel is likely to be started in near future. NIOS in collaboration with CIET, NCERT will jointly run this channel. NIOS Video programmes would be telecast on this channel. • The Media Unit, NIOS ensures an academic perspective along with the technical responsibilities of production of audio and video programmes, which are one of the most important components of the multi-channel package offered by the NIOS. These audio and video programmes both supplement and complement the other channels of 88 learning: i.e. printed self-learning materials and personal contact programmes. Most of the programmes, except for the language courses (Hindi, English, Urdu), have been produced both in English and Hindi Version. Using documentary, docu-drama and other interesting formats, these programmes attempt to present the topic/theme in a simple, interesting and engaging manner, so that the learners get a clear understanding and insight into the subject matter. • The video programmes are being telecast on DD-I from 05.02 a.m. to 05.25 a.m. on every Friday and on Educational Channel - Gyan Darshan on every day from 6.30 p.m. to 7.00 p.m. The audio-video cassettes are also sent to AIs, AVIs, SAIEDs and Regional Centers of NIOS 5) State E T Cell State council of educational research and training (SCERT) or Statew Institute of Education (SIE) is established in each state which are related to the directorate of education . Each SCERT has a state educational technology that works for promoting educational technology in that concern state. It has administrative control and monitoring of in- service training of secondary school teachers with respect to awareness and enrichment programmes in educational technology. • Coordination of various programs of training in educational technology for secondary school teacher, teacher educators and educational administration which are conducted by N.C.E.R.T. and N.U.E.P.A., Regional College of education and other various National Level and Regional level education agencies. • Provides academic inputs and infrastructure for schools, DIETS, CTES, IASEs. • Prepares curriculum, textbook, teaching learning materials for school education. • Conducts research in the field of educational technology. • Organization of training courses of Audio Visual Education and Education Technology. • Organization of film library including loaning of films and other components to schools. • Inspection and repair of Audio Visual educational machinery in schools.as following functions 6) AVRC The full name of AVRC is Audio-visual resource centre. As early as in 1984 University Grants Commission (UGC), New Delhi has launched Country Wide Class Room (CWCR) and production facilities at 6 Universities in India through establishing media centers in the name of Audio Visual Research Centers (AVRCs) (AVRCS) (later these centers have been renamed as Educational Multimedia Research Centers (EMMRCS).

This was mainly to use electronic media for the quality enrichment of higher education.

UGC began its transmission of CountryWide Class Room (CWCR) program from 15thAugust 1984 through Doordarshan National network. Initially the co-ordination with these centers was done from UGC office with the support of a consultant. Subsequently, an Inter-University Centre named as 'Consortium for Educational Communication' (CEC) was set up in the year 1993 to co-ordinate with media centers (AVRCs and EMMRCs) and to make CWCR mission most effective and successful Audio Visual Research Centre provides valuable resource material for higher education and mass communication. The programmes produced at the centre are televised 89 under UGC/CEC countrywide classroom programme.

During 1996-97, the centre
produced 16 educational programmes covering various subjects like earth sciences, ecology, wildlife, chemistry, maths, sports, social sciences and classical dance etc.
despite staffing constraints. Of these 6 programmes were produced in Hindi.
The centre
also undertakes research in all aspects of educational technology in relation to learning for both urban and rural collage going students in various disciplines. It invites faculty from
within and outside
the University as subject experts to participate in the activities of the centre to write scripts on the topics of their subject specialisation followed by the production of film. The
centre has made about 180 programmes covering various subjects and areas. The AVRC is an academic support unit that exists primarily to facilitate speedy, prompt and precise service for audio-visual related requests and services of the institution. It envisions itself as the provider of world class and competitive audio-visual materials, equipment and facilities served by highly-competent and skilled staff traits needed in the daily transactions. Specifically, the AVRC aims to: 1. Deliver updated, reliable and functional instructional equipment and materials; Respond quickly to the needs and requirements related to audio-visual resources of the University ; Facilitate the effective orientation and technological skills development of its end-users; Provide efficient and reliable means of ID processing and production; and Acquire feedback and conduct research for the improvement of the AV services and materials. 7) EMRC Educational Multimedia Resource Centre is also known as EMRC which has been Started by UGC in 22 Universities of India Activities: • To produce high quality audio-visual programs, • Developing multimedia content, • Producing educational documentaries, • Produce lecture series and e-content modules on undergraduate program, •
Studying, promoting and
experimenting with new techniques/technology that will increase the reach/effectiveness of educational communications, •
Preparing documentary films, • Produce interactive multimedia learning materials, • Providing training in audio/video/multimedia production, 8) NIST The National Institute of Standards and Technology (NIST) is offering support to qualified institutions interested in developing teaching materials and curricula that instruct students in the nature, role and importance of technical standards in modern society and commerce. Founded in 1901, NIST is a non-regulatory federal agency within the U.S. Department of Commerce.
NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. 90
NIST carries out its mission through the following programs: • the NIST Laboratories, conducting world-class research, often in close collaboration with industry, that advances the nation's technology infrastructure and helps U.S. companies continually improve products and services; • the Hollings Manufacturing Extension Partnership, a nationwide network of local centers offering technical and business assistance to smaller manufacturers to help them create and retain jobs, increase profits, and save time and money; and • the Baldrige Performance Excellence Program, which promotes performance excellence among U.S. manufacturers, service companies, educational institutions, health care providers, and non profit organizations; conducts outreach programs; and manages the annual Malcolm Baldrige National Quality Award which recognizes performance excellence and quality achievement 91
92
Unit: IV Emerging Educational Technology In this unit, You will learn about, • 3D Printing • Mobile Learning • Massive Open Online Courses • Blended Learning/Classrooms • Cloud Computing • Wearable Technology in Education • Gamification 1) 3D Printing Introduction to 3D Printing A method of manufacturing known as ‘Additive manufacturing’, due to the fact that instead of removing material to create a part, the process adds material in successive patterns to create the desired shape. Main areas of use: • Prototyping • Specialized parts – aerospace, military, biomedical engineering, dental • Hobbies and home use • Future applications – medical (body parts), buildings and cars 3D Printing uses software that slices the 3D model into layers (0.01mm thick or less in most cases). Each layer is then traced onto the build plate by the printer, once the pattern is completed, the build plate is lowered and the next layer is added on top of the previous one. Typical manufacturing techniques are known as ‘Subtractive Manufacturing’ because the process is one of removing material from a preformed block. Processes such as Milling and 93

Cutting are subtractive manufacturing techniques. This type of process creates a lot of waste since; the material that is cut off generally cannot be used for anything else and is simply sent out as scrap. 3D Printing eliminates such waste since the material is placed in the location that it is needed only, the rest will be left out as empty space. Advantages and Limitations Layer by layer production allows for much greater flexibility and creativity in the design process. No longer do designers have to design for manufacture, but instead they can create a part that is lighter and stronger by means of better design. Parts can be completely re-designed so that they are stronger in the areas that they need to be and lighter overall. 3D Printing significantly speeds up the design and prototyping process. There is no problem with creating one part at a time, and changing the design each time it is produced. Parts can be created within hours. Bringing the design cycle down to a matter of days or weeks compared to months. Also, since the price of 3D printers has decreased over the years, some 3D printers are now within financial reach of the ordinary consumer or small company. The limitations of 3D printing in general include expensive hardware and expensive materials. This leads to expensive parts, thus making it hard if you were to compete with mass production. It also requires a CAD designer to create what the customer has in mind, and can be expensive if the part is very intricate. 3D Printing is not the answer to every type of production method; however its advancement is helping accelerate design and engineering more than ever before. Through the use of 3D printers designers are able to create one of a kind piece of art, intricate building and product designs and also make parts while in space! We are beginning to see the impact of 3D printing many industries. There have been articles saying that 3D printing will bring about the next industrial revolution, by returning a means of production back within reach of the designer or the consumer. Types of 3D Printing 1. FDM – Fused Deposition Modeling Fused Deposition Modeling, is an additive manufacturing technology commonly used for modeling, prototyping, and production applications. FDM works on an "additive" principle by laying down material in layers. A plastic filament or metal wire is unwound from a coil and supplies material to an extrusion nozzle which can turn the flow on and off. The nozzle is heated to melt the material and can be moved in both horizontal and vertical directions by a numerically controlled mechanism, directly controlled by a computer-aided manufacturing (CAM) software package. The model or part is produced by extruding small beads of thermoplastic material to form layers as the material hardens immediately after extrusion from the nozzle. Stepper motors or servo motors are typically employed to move the extrusion head. FDM, a prominent form of rapid prototyping, is used for prototyping and rapid manufacturing. Rapid prototyping facilitates iterative testing, and for very short runs, rapid manufacturing can be a relatively inexpensive alternative. 94
Advantages: Cheaper since uses plastic, more expensive models use a different (water soluble) material to remove supports completely. Even cheap 3D printers have enough resolution for many applications. Disadvantages: Supports leave marks that require removing and sanding. Warping, limited testing allowed due to Thermo plastic material. 2. SLA – Stereolithography Stereolithography is an additive manufacturing process which employs a vat of liquid ultraviolet curable photopolymer "resin" and an ultraviolet laser to build parts' layers one at a time. For each layer, the laser beam traces a cross-section of the part pattern on the surface of the liquid resin. Exposure to the ultraviolet laser light cures and solidifies the pattern traced on the resin and joins it to the layer below. After the pattern has been traced, the SLA's elevator platform descends by a distance equal to the thickness of a single layer, typically 0.05 mm to 0.15 mm (0.002" to 0.006"). Then, a resinfilled blade sweeps across the cross section of the part, re-coating it with fresh material. On this new liquid surface, the subsequent layer pattern is traced, joining the previous layer. A complete 3-D part is formed by this process. After being built, parts are immersed in a chemical bath in order to be cleaned of excess resin and are subsequently cured in an ultraviolet oven. Stereolithography requires the use of supporting structures which serve to attach the part to the elevator platform, prevent deflection due to gravity and hold the cross sections in place so that they resist lateral pressure from the re-coater blade. Supports are generated automatically during the preparation of 3D Computer Aided Design models for use on the stereolithography machine, although they may be manipulated manually. Supports must be removed from the finished product manually, unlike in other, less costly, rapid prototyping technologies. Advantages and Disadvantages One of the advantages of stereolithography is its speed; functional parts can be manufactured within a day. The length of time it takes to produce one particular part depends on the size and complexity of the project and can last from a few hours to more than a day. Most stereolithography machines can produce parts with a maximum size of approximately 50×50×60 cm (20"×20"×24") and some, such as the Mammoth stereolithography machine (which has a build platform of 210×70×80 cm), are capable of producing single parts of more than 2m in length. Prototypes made by stereolithography are strong enough to be machined 95

and can be used as master patterns for injection molding, thermoforming, blow molding, and various metal casting processes. Although stereolithography can produce a wide variety of shapes, it has often been expensive; the cost of photo-curable resin has long ranged from $80 to $210 per liter, and the cost of stereolithography machines has ranged from $100,000 to more than $500,000. Cheaper SLA 3D printers have been created recently and one can only assume that in the future more will be created that are within the price range of individuals. 3) SLS - Selective laser sintering Selective laser sintering is an additive manufacturing technique that uses a high power laser (for example, a carbon dioxide laser) to fuse small particles of plastic, metal (direct metal laser sintering), ceramic, or glass powders into a mass that has a desired three-dimensional shape. The laser selectively fuses powdered material by scanning cross-sections generated from a 3-D digital description of the part (for example from a CAD file or scan data) on the surface of a powder bed. After each cross-section is scanned, the powder bed is lowered by one layer thickness, a new layer of material is applied on top, and the process is repeated until the part is completed. Because finished part density depends on peak laser power, rather than laser duration, a SLS machine typically uses a pulsed laser. The SLS machine preheats the bulk powder material in the powder bed somewhat below its melting point, to make it easier for the laser to raise the temperature of the selected regions the rest of the way to the melting point. Some SLS machines use single-component powder, such as direct metal laser sintering. However, most SLS machines use two-component powders, typically either coated powder or a powder mixture. In single-component powders, the laser melts only the outer surface of the particles (surface melting), fusing the solid non-melted cores to each other and to the previous layer. Compared with other methods of additive manufacturing, SLS can produce parts from a relatively wide range of commercially available powder materials. These include polymers such as nylon (neat, glass-filled, or with other fillers) or polystyrene, metals including steel, titanium, alloy mixtures, and composites and green sand. The physical process can be full melting, partial melting, or liquid-phase sintering. Depending on the material, up to 100% density can be achieved with material properties comparable to those from conventional manufacturing methods. In many cases large numbers of parts can be packed within the powder bed, allowing very high productivity. SLS is performed by machines called SLS systems. SLS technology is in wide use around the world due to its ability to easily make very complex geometries directly from digital CAD data. While it began as a way to build prototype parts early in the design cycle, it is increasingly being used in limited-run manufacturing to produce end-use parts. One less expected and rapidly growing application of SLS is its use in art. Benefits SLS has many benefits over traditional manufacturing techniques. Speed is the most obvious because no special tooling is required and parts can be built in a matter of hours. Additionally, SLS allows for more rigorous testing of prototypes. Since SLS can use most alloys, prototypes can now be functional hardware made out of the same material as production components. 96

SLS is also one of the few additive manufacturing technologies being used in production. Since the components are built layer by layer, it is possible to design internal features and passages that could not be cast or otherwise machined. Complex geometries and assemblies with multiple components can be simplified to fewer parts with a more cost effective assembly. SLS does not require special tooling like castings, so it is convenient for short production runs. Applications This technology is used to manufacture direct parts for a variety of industries including aerospace, dental, medical and other industries that have small to medium size, highly complex parts and the tooling industry to make direct tooling inserts. With a build envelop of 250 x 250 x 185 mm, and the ability to 'grow' multiple parts at one time, SLS is a very cost and time effective technology. The technology is used both for rapid prototyping, as it decreases development time for new products, and production manufacturing as a cost saving method to simplify assemblies and complex geometries. Constraints The aspects of size, feature details and surface finish, as well as print through error in the Z axis may be factors that should be considered prior to the use of the technology. However, by planning the build in the machine where most features are built in the x and y axis as the material is laid down, the feature tolerances can be managed well. Surfaces usually have to be polished to achieve mirror or extremely smooth finishes. For production tooling, material density of a finished part or insert should be addressed prior to use. For example, in injection molding inserts, any surface imperfections will cause imperfections in the plastic part, and the inserts will have to mate with the base of the mold with temperature and surfaces to prevent problems. In this process metallic support structure removal and post processing of the part generated is a time consuming process and requires use of EDM and/or grinding machines having the same level of accuracy provided by the RP machine. Current and future applications of 3D Printing Biomedical Engineering In recent years scientists and engineers have already been able to use 3D printing technology to create body parts and parts of organs. The first entire organ created through 3D Printing is expected to be done in the coming years. The process of creating the organ or body part is exactly the same as if you were to create a plastic or metal part, however, instead the raw material used are biological cells created in a lab. By creating the cells specifically for a particular patient, one can be certain that the patient's body will not reject the organ. Another application of 3D printing in the biomedical field is that of creating limbs and other body parts out of metal or other materials to replace lost or damaged limbs. Prosthetic limbs are required in many parts of the world due to injuries sustained during war or by disease. Currently prosthetic limbs are very expensive and generally are not customized for the patient's needs. 3D printing is being used to design and produce custom prosthetic limbs to meet the patient's exact requirements. By scanning the patient's body and existing bone structure, designers and engineers are able to re-create the lost part of that limb. 97

Aerospace and Automobile Manufacturing High technology companies such as aerospace and automobile manufacturers have been using 3D printing as a prototyping tool for some time now. However, in recently years, with further advancement in 3D printing technology, they have been able to create functional parts that can be used for testing. This process of design and 3D printing has allowed these companies to advance their designs faster than ever before due to the large decrease in the design cycle. From what used to take months between design and the physical prototype, now within hours the design team can have a prototype in their hands for checks and testing. The future of 3D printing in these industries lies with creating working parts directly from a 3D printer for use in the final product, not just for testing purposes. This process is already underway for future cars and aircraft. The way in which 3D printing works (creating a part layer by layer) allows the designer to create the part exactly the way is needs to be to accomplish the task at hand. Extremely complex geometry can be easily created using a 3D printer, allowing for parts to be lighter, yet stronger than their machined counterparts. Construction and Architecture Architects and city planners have been using 3D printers to create a model of the layout or shape of a building for many years. Now they are looking for ways of employing the 3D printing concept to create entire buildings. There are already prototype printer systems that use concrete and other more specialized materials to create a structure similar to a small house. The goal is the replace many cranes and even construction workers with these printing systems. They would work by using the 3D design model created on CAD software, to create a layer by layer pattern on the building just as a normal 3D printer works today. Most of the innovation in this area will have to come from the creation of the appropriate materials. Product Prototyping The creation of a new product is always one of that involves many iterations of the same design. 3D Printing revolutionized the industry by allows designers to create and the next day see and touch their design. No longer did it take several meetings for everyone to agree on one design to create, and then wait months for the actual part to arrive. Nowadays a version of each idea is created and the next day, all are reviewed together, thus giving the ability to compare and contrast each one's features. Plastic parts for example require molds and tooling to be created, these custom parts are expensive to create, therefore one must be certain the part designed meets the requirements. With 3D printing you can create a part that will look and feel exactly like the finished product. Some parts can also be tested just as the real injection molded part would. 2) Mobile Learning Mobile learning also known as m-learning is a new way to access learning content using mobiles. Mobile learning supports, with the help of mobile devices, continuous access to the learning process. This can be done using devices like your phone, laptop or tablet. 98

M-learning in Education More and more schools are starting to use laptops or tablets. They're fun for children and adults. Educational apps are becoming increasingly available to teachers and trainers. Examples of mobile learning in education: a) Offering mobile learning material This is the most common way of using mobile learning. You can offer texts, videos or audios. Participants can be given assignments after watching a video that their instructor has put online. This method of mobile learning is relatively less interactive. It's more about individual consumption. There is no interaction between the trainer and the learners, which makes it an asynchronous way of learning. b) Interaction during lessons Instructors can also use mobile devices to increase interaction. For example, you can ask questions during your training by using online discussion forums or asking your learners to complete a survey after taking a training. Instructors ask questions and the learners answer them using their mobile devices or communicate between themselves in a group discussion forum. It's possible to get immediate feedback. This is especially effective when training large groups. c) Synchronous learning Would you like to have immediate feedback from your teacher or fellow students? This is possible with synchronous learning. You are able to get direct feedback even when you are at home. In addition, teachers can interact with their students during lectures. Basic Elements of M-Learning Basic elements of mobile learning are learner, teacher, environment, content and assesstment. i) Learner: Learners at the center in all teaching and learning activities according to new education approaches. All the other elements serves to the learner. Mobile learning builds on the learner's interests, experiences and needs. Makoe (2010) claim that as the mobile learning concept implies, the pedagogical approach places the student at the center of the learning process. The learner plays an active role from determination of the goals until the evaluation stage. Learner's roles are giving below: • Access information when they need • Responsible for own learning • Learning with their learning speed • Discover and use their learning styles • Create and share new information or product • Study with their peers collaboratively • Evaluation themselves and other groups 99
ii) Teacher: Books and other media elements store information and teachers convey it to students in traditional learning environments. On the other hand, recently using technology for store information, support more accessible information for students. According to Halis (2002) this situation created a new dimension opposed to traditional teacher role about information search and use. Figure 1 provides much reduced overview of the changing roles of teachers: Figure 1: Teachers role in developing technology era According to Ghaln (2011) before television the main roles of the teachers were the role of the domain expert that presents information to the students. The transition of the media formats changed the role of the average teacher from being an expert towards being a presenter of the expertise of others. With the Web 2.0 and social networks many things have changed again. In these settings the role of the teachers needs to change from the presenter of expert knowledge to a moderator of opposing positions. With the mobile technologies changed role and responsibility of the learners the role of the teacher changes slowly towards that of a consultant. In this role teachers need to be able to identify the students' interests, relate these interests to topic related learning goals, and offer opportunities to reach these goals that are related to the specific conditions a learner is in. Teachers' roles in mobile learning: • Qualified to use required mobile tools and technologies • Determine the strengths and weaknesses of used methods and study to resolves the weaknesses with • different methods • Facilitator guide • Advisory • High levels of self-confident about courses • Learn with their students • Eliminates the barriers • Increase motivation of learners • Arrange activities to support interactive interactions between collaborative groups • Arrange activities for evaluation of process iii) Content: Issues that expected to learn by students. Content should be decided in consultation with all stakeholders such as learners, teachers, parents etc. Otherwise teachers cannot get the desired results. Learning content must enable a user to quickly zone into needed information. In addition, the content can be presented with interactive games or quizzes. Content should support with graphics video and other multimedia elements. Siragusa et al. 100

(2007) described that the detail and extent of the content provided to students may vary depending upon the students' pedagogical needs. iv) Environment: Environment must design properly to obtain positive learning experiences. Environment is that place when students reach information. Students studying entirely online must have access to all of the unit content including the learning outcomes, assignment requirements and relevant resources. Students attending face-to-face classes may receive the content in class and additional content on online with mobile technologies (Siragusa et al., 2007). Students can access course content, while travelling on the train or in a coffee shop. Environment must increased interaction between students-students and students-teachers. Wikis, social networks, or blogs can use for increase social interaction. This enviornments must design available for mobile phones, laptops and other mobile tools. Uzunboylu and Ozdamli (2011) indicated that m-learning with hand held devices eradicated geographical borders, enabling co-operative learning environments which have individual and group interaction in the education. v) Assessment: Assessment is a critical component of the complete m-learning. Mobile technologies can assess record and report learner performance to the instructors. So, student evaluation should make via database logs, software packages, online exams, chat room, discussion board, online quizzes, or project evaluation. Also students should evaluate themselves and others. It provides the pieces needed to accurately evaluate a learner's knowledge, skills, creativeness and etc. Sharples et al. (2005) described that assessment is matched to the ability of the learners, offering diagnosis and formative guidance that builds on success. According to Behera (2011) the assessment should help the learner clear all his doubts based on the course and at the same time, learn a little bit more about the same. A good designed course should provide immediate feedback so that the learner is able to judge how well he has understood the content of the course. The feedback shouldn't be such that it discourages the learner and makes him/her feel like he/she doesn't know anything. A feel good factor is very important for the learner after he takes the course along with the assessment. Basic Characteristics of M-Learning Mobile learning has different characteristics. The core characteristic of mobile learning are ubiquitous, portable size of mobile tools, blended, private, interactive, collaborative, and instant information. Seppälä and Alamäki (2003) claimed that the core characteristic of mobile learning enables learners to be in the right place at the right time, that is, to be where they are able to experience the authentic joy of learning. Figure 3 illustrated basic characteristics of an effective mobile learning approach. (i) Ubiquitous/Spontaneous: Mobile learning is more spontaneous than other learning types. It is this spontaneity that is probably the most defining characteristic of mobile learning. Mobile learning is context aware, meaning that students can learn everywhere. Wireless technologies such as laptop computers, palmtop computers, and mobile phones are revolutionising education and transforming the traditional classroom based learning and teaching into anytime and anywhere education (Cavus & Ibrahim, 2009). 101 (ii) Portable size of mobile tools: Mobile learning tools are small and portable (Quinn, 2000; Ahonen et al., 2004; Cavus & Ibrahim, 2009). Students can use it everywhere during their learning activities. (iii) Blended: Teachers can use this approach with blended learning model (Uzunboylu, Cavus & Ercag, 2009). Students can use mobile tools for homework, projects or etc. in the education. Blended learning, which combines classroom instruction with m-learning, can maximize the benefits of both face-to-face and online methods (Bonk & Graham, 2006; Ocak, 2010). (iv)Private: M-learning is private. It means that only one learner at a time usually has access to the mobile tool and that when students want to access information connects and downloads independently from other learners (Chidi, 2002; BenMoussa, 2003; Zhang, 2003; Virvou & Alepis, 2005). (v) Interactive: M-learning environments which utilizes the latest technologies to bring an interactive learning environment into learning and teaching activities (Cavus & Uzunboylu, 2009). Students are not passive, the functions of mobile tools and environments allow varying levels of interactivity. Sharples et al. (2005) indicated that the technological layer represents learning as an engagement with technology, in which tools such as computers and mobile phones function as interactive agents in the process of coming to know. (vi) Collaborative: Mobile technologies are support communication between students and teachers. So mobile technologies may use for collaborative learning activities in the education (Uzunboylu, Cavus & Ercag, 2009; Virvou & Alepis, 2005). (vii) Instant information: Using a mobile tool is all about immediacy (Eteokleous & Ktoridou, 2009; Cavus & Ibrahim, 2009). According to Cohen (2010) the need is for quick answers to specific questions. Learning content must reflect this requirement by providing material that enables a learner to quickly zone into information. Examples of instant information are definitions, formula, and equations, etc. Advantages of Mobile Learning i) Wherever and whenever It's possible to lay in bed and watch a lecture or complete a survey whenever you want. ii) Motivation "We are going to take an online quiz!" You can see the smile on the children's faces. Children are motivated to learn when they can use tablets or other mobile devices. Employees also feel more motivated to learn something new or to take a training if they can take their learning materials everywhere with them, especially when they don't have time to learn during their regular work hours. iii) Different types of content You can add videos, audio files, and images with mobile learning. Videos make it possible to make learning livelier and more interesting. 102

iv) Long distance is not a problem While one learner might be in New York and the other in Amsterdam, it's still possible to view the same content and take the same tests! This is one of the main benefits of mobile learning. Disadvantages of mobile learning i) Distraction Mobile devices can be a great distraction for participants. Children like learning on tablets, but gaming on tablets seems to be even more fun! As a teacher you are not always able to control what your pupils are doing on their tablets. For adults, mobile learning can also be distracting if your users get constantly interrupted with text messages and notifications. Therefore, it requires self-discipline and focus on their part. However, if you can make your training interactive and fun, the other applications available on mobiles won't be a distraction for your learners. ii) Lack of Internet connection or electricity Using mobile devices for e-learning could be an issue if your users don't have Internet connection or electricity readily available. Inspite of that, statistics show that today there are more mobile devices than people in the world. So, a lack of Internet connection, poor connection quality and access to electricity should become problems of the past. How mobile learning supports organizational goals? i) Self-directed anytime, anywhere learning In the past, workforce training was largely completed at a specific location, such as in a classroom or office. Even online learning generally finds learners still situated in front of a computer in an office or other formal training area. But mobile learning enables training access from anywhere a user can connect to the Internet. Content can be consumed at home, during travel, even on public transportation - making it possible to deliver training to a wider audience. Now companies can offer training to employees who have a hard time attending classroom training or who lack access to laptop or desktop computers. ii) Convenience during the busy day Mobile learning allows learners to set their own training schedules. They can access educational materials throughout their daily routines, during pauses in their regular work, while participating in other activities that don't require their complete attention, or even as a "soundtrack" that provides real-time instruction or immediate problem solving during specific tasks. iii) Better Outcomes Though mobile learning is relatively new, research shows that it results in better retention, reduces training times, and boosts productivity than more traditional training models. Better retention occurs when mobile learning is presented as a stand-alone delivery method or as part of a blended learning program. For example, one global pharmaceutical company achieved a 103 53 percent improvement in knowledge retention among staff members by using mobile learning to introduce a new product (Werner & da Gama). A recent study of mobile learning focused on how well participants retained training material. Some learners attended a live lecture and others listened to a podcast deployed through a mobile device. The podcast viewers showed considerably better retention, scoring on average nine out of 100 more than the live lecture participants (McKinney, Dyck, & Luber). Evidence suggests mobile learning can significantly increase the training speed and productivity of a workforce. The Merrill Lynch GoLearn initiative provided an already mobile and online-learning - savvy workforce new training via mobile devices (Swanson). The primary goal was to determine the effectiveness of mobile learning. The experiment also compared mobile learning with the effectiveness of traditional online learning and explored what additional uses - and return on investment - the company could get from employee smartphone use beyond simply accessing email. Merrill Lynch deployed three compliance courses using traditional computers and mobile devices. In a follow-up survey, 99 percent of participants who used a smartphone said the mobile format supported their learning, and all indicated they were willing to undertake more mobile training. More than 75 percent of these same learners identified convenience, time savings, and training with no distractions as key benefits of mobile learning. The survey also provided strong support for being able to learn on the go as a benefit of mobile learning. Participants who used a smartphone reported completing the training in a wide variety of locations - 32 percent during business travel, 26 percent at home, 24 percent while commuting, and 18 percent in the office or other locations. The smartphone users finished courses on average 45 percent faster than the traditional computer users. Most importantly, learning effectiveness did not degrade when employees trained on their mobile devices; the average test score rivaled that found in the traditional computer-based online learning control group. The bottom line for Merrill Lynch was its GoLearn experiment produced an estimated 4,270 hours of extra productivity by providing training on mobile devices. 3) Massive Open Online Courses (MOOCs) Introduction to MOOCs: Definition and Characteristics Massive open online courses (MOOCs) are a flexible and open form of self-directed, online learning designed for mass participation. There are no fees or entry requirements and no formal academic credit is available. While completion rates are low (on average ten per cent 1) due to varying motivations for enrolling in a MOOC, absolute numbers of participants who complete are usually high. While access to the course material is free, MOOC platform providers often offer certificates of completion at a cost. MOOC platforms provide institutions with cloud-based hosting environments for delivering courses, offering scale and functionality while the institution provides the course material and reputational value. The major English-medium MOOC platform providers are Coursera, edX, Canvas and Futurelearn; and there is a multitude of smaller platforms. Each platform has its technical infrastructure and business model; for example, some platforms align themselves with institutions, whereas others allow individual educators more freedom. 104

The affordance of MOOC technology are as follows: • Educator Involvement: While educators are involved in the design and production of the MOOC, their involvement during the running of the course is minimised because of the lack of formal assessment or formal academic credit. • Engagement: It is possible to engage with a large number of students via discussion forums. • Re-watchable: Students are able to watch and re-watch lecture videos. • Scale: MOOCs are designed to reach a large number of students. • Assessable: Most MOOCs include in-video, concept-check questions, with immediate feedback, as well as peer review. • Customised learning experience: Participants can learn at their own pace and choose which material they engage with. MOOCs in the broader higher education landscape In the curriculum landscape MOOCs are located in the non-formal space. There are a number of interesting experiments taking place, with MOOCs in the semi-formal space and exploring new types of accreditation. Figure 2: The Curriculum Landscape While MOOCs are a form of online course, they differ in several ways, as explained in Table 1. Table 1: Differences between formal online courses and MOOCs Online Courses MOOCs Cost to user Fees No fees; possibly certificates and/or support Entrance requirements Yes, as per conventional courses None Scale Limited. Capped by resources available for support and assessment Thousands. Savings due to limited lecturer support 105
Lecturer's role Responsible for curriculum alignment, quality assurance (QA) and support Flexible role regarding the curriculum. Limited individual support Copyright Largely proprietary. Some open Content may be proprietary or open. User-generated content often © MOOC provider Providers Distance education providers Traditional residential research universities partnered with private companies Analytics No, not usually Yes, one of the promises Certification Conventional Non-conventional Quality assurance Aligned with the usual formal courses QA processes As per non-formal offerings Categories of MOOCs MOOCs can be differentiated in terms of the strategic goals that they aim to address. A primary distinction is between inward-facing courses (aimed at existing students) and outward-facing courses (aimed at participants with no connection to the university). A further distinction is made between the following categories, with categories 1 and 5 representing outward-facing and 2, 3 and 4 representing inward-facing courses: • Category 1 - Teaching showcase: General interest course in which an institution's teaching is showcased, with the aim of raising the appeal or reputation of the institution. • Category 2 - Gateway skills: Aimed at prospective undergraduate students, with the intention of preparing/up skilling prospective students for a particular area of study. • Category 3 - Graduate literacies: Provides students entering postgraduate level of study with opportunities to develop the necessary skills, such as proposal writing, research methods and statistical analysis. • Category 4 - Professional showcase: Focuses on professional certification and professional development. • Category 5 - Research showcase: Aimed at raising the appeal of the institution as a centre for research excellence. 106
Emergent forms of MOOC - Type courses As shown in Figure 3, there are emergent new MOOC – type forms being explored, spawning new acronyms. Some of these are: • OBC: Open Boundary Course – formally enrolled students as well as outsiders study the course together – although with different levels of educational support • SPOC: Small Private Online Course • MOC: Massive Online Course • Wrapped MOOC: A MOOC that is adapted for paying students or included as part of an existing course for enrolled students Workplace and non-formal contexts While the MOOC movement is emergent, global trends have made it evident that one clear application of MOOCs is workplace or corporate training. MOOCs may provide opportunities for students to enter the workplace through providing them with exposure to new fields or training in specific skills, often in emerging industries. The MOOC platform providers are beginning to offer learning pathways of certification (Coursera Specializations or edX xSeries), which, while not akin to university credits, may offer alternatives to qualification. The current trend for students to showcase their MOOC certificates on CVs, job portals or personal profiles (such as LinkedIn) is apparent. Another related application is MOOCs that offer continuing professional development opportunities. MOOCs that cater to this sector offer more structured qualifications at relatively low cost, thus increasing accessibility. Some MOOC providers are calling these qualifications 'nano-degrees'. In adopting this model, South African institutions could forge connections with industry organisations to cater for sector needs and in areas of skills shortages. Costs of MOOC production The costs of producing a MOOC vary considerably, and, as yet, there is no viable business model to recoup all the expenses incurred in production. The sale of certification generates some income and extensions to this aspect of the model (for example, the introduction of 107

linked courses in a programme of study) and new uses of MOOCs (such as add-ons and paid- for additional services) are being explored with some success by institutions globally. Some of the international platforms (Coursera and FutureLearn) do not require any upfront financial contribution from the partner universities, as they operate on the assumption that the courses flighted on the platforms will generate future income, which will be shared between the platform and the university partner. In contrast, edX is a non-profit venture that requires partner university contributions to fund its operations. Some universities fund their MOOC programmes through donor funding. The major cost drivers in MOOC production and delivery are: the number of faculty members, administrators, and instructional support personnel participating in the process; the quality of videography; the nature of the delivery platform; technical support for participants; programming for special features such as computer code auto-graders, virtual labs, simulations, or gamification; and analysis of platform data. MOOC production teams that were described to us seldom included fewer than five professionals and, in at least one instance, over 30 people were involved. Course length was not a reliable predictor of costs. The main costs of producing MOOCs, from an institutional perspective are: 1) Institutional infrastructure: Setting up procedures for decision-making about platforms and the selection and quality assurance of courses is time consuming for a range of institutional personnel (from university leadership to legal advisors). Initial upfront investment may be required for some international platforms (which could be sourced from donor funding). Support staff: Generally MOOCs require a support team of learning designers, video production specialists and academic content assistants to work on creating the course content – although there are a range of options, from repurposing existing internal units, to setting up regional collaborations between institutions for shared capacity development, to outsourcing these roles to private providers. The actual costs will depend on the nature of the particular course – however, it can be assumed that a single course will require the inputs of a team of two or three support staff for several months. Educators: Depending on the type of course and the support available, academics typically report spending between 100 and 400 hours in the process of production. Unlike traditional courses, the bulk of the input is done in production, while significantly less time is spent while the course is running. Effectively, teaching time is being built into the course during production. In some instances, academics will require funding to pay for someone to teach in their place for the period devoted to production. Given that course production does not offer any academic career rewards, motivation to spend the time on producing a MOOC, rather than other academic activities will have to be considered. Production: MOOCs on the major international platforms favour short video-recorded lectures as the main media for the content. High-quality video is costly and requires access to equipment (which can be hired or bought). The actual cost per minute of video will depend on the style of the segment: whether it is a cheaper screen cast or a high-production video. These costs range widely from R2 000–R12 000 per short video. When estimating this cost, the staffing and equipment (filming studio or video camera, sound and lighting) are included. 108
Instead of fully investing in capital equipment and personnel, it is possible to outsource to a commercial video production company or hire in contractors for intensive film shoot days. Course material: If specific course material under copyright licence is required, there may be costs incurred in buying the rights to use it. Generally, open-source material or originally produced material is favoured in the production of MOOC. Caveats and concerns There are several concerns about MOOCs, most of which have been alluded to. In short, the issues that may be of concern include: Forms of certification: For some, lack of certification or the emergent nature of new forms of certification may be a concern. Digital and critical literacies: Research has shown that participating in MOOCs requires critical and digital literacies, that is, skills and competences to thrive and learn in a digital environment. Connectivity: Most MOOCs include video, and assume good, reasonably priced connectivity and bandwidth, thus participation for limiting many South Africans, especially those in rural areas and away from formal institutions. Language: MOOCs are delivered primarily in English, although globally language-specific platforms are emerging, especially in European languages (Spanish and French). Copyright: MOOCs and other online courses change the rules of engaging with copyright in numerous ways (the student body extends beyond the university, user content is generated etc.). It is a more complex intellectual property environment. 4) Blended Learning/Classrooms A National Education Association (NEA) policy brief on blended learning states: Blended learning (aka hybrid and mixed-mode) is an environment in which: • A student learns in a blended model of face-to-face instruction with a licensed teacher and technology-based instruction that best meets the educational needs of the student. • During the technology-based instruction, under the guidance of the teacher, the student has control over the time, place, path and/or the pace of the curriculum to form an integrated instructional approach. Blended Learning is not so much an innovation as it is a natural by-product of the digital domain creeping into physical spaces. Broadly speaking, blended learning just means a mix of learning online and face-to- face, which means it's likely your students are already doing some form of blended learning and have for years. As digital and social media become more and more prevalent in the life of learners, it was only a matter of time before learning became 'blended' by necessity. 109

Examples of blended learning • Managing the marking, entering and releasing of grades for a course with over 700 students using an online grade centre in Learning@Griffith creating efficiency and accuracy for multiple markers and the course convenor by reducing double handling, while giving students flexible and timely access to their results and feedback. • Delivering a lecture to on and off campus students simultaneously using an online virtual classroom tool helps to create a sense of community for the whole group and reduces workload for the lecturer by presenting only once. • Small group problem based learning activities are managed more effectively and efficiently within a large class by using an online collaborative workspace, allowing for greater transparency in group work assessment as well as providing an archive of resources for current and future students. • Weekly online practice quizzes to support lecture and textbook material using automatic marking functionality producing immediate and automatic feedback to individual students about their understanding of concepts and avoiding ongoing workload for the teaching staff. Types of Blended Learning 1. Station Rotation Blended Learning Station-Rotation blended learning is a: "...model (that) allows students to rotate through stations on a fixed schedule, where at least one of the stations is an online learning station. This 110 model is most common in elementary schools because teachers are already familiar with rotating in centers and stations. 2. Lab Rotation Blended Learning 'The Lab Rotation' model of blended learning, similar to "Station Rotation,' works by "allow(ing) students to rotate through stations on a fixed schedule...in a dedicated computer lab allow(ing) for flexible scheduling arrangements with teachers...enabl(ing) schools to make use of existing computer labs." 3. Remote Blended Learning (also referred to as Enriched Virtual) In Enriched Virtual blended learning, the student's focus is on completing online coursework while only meeting with the teacher intermittently/as-needed. This approach differs from the Flipped Classroom model in the balance of online to face-to-face instructional time. In an Enriched Virtual blended learning model, students wouldn't see/work with/learning from a teacher on a daily basis face-to-face but would in a 'flipped' setting. 4. Flex Blended Learning The 'Flex' is included in types of Blended Learning and its model is one in which... "a course or subject in which online learning is the backbone of student learning, even if it directs students to offline activities at times. Students move on an individually customized, fluid schedule among learning modalities. The teacher of record is on-site, and students learn mostly on the brick-and-mortar campus, except for any homework assignments. The teacher of record or other adults provide face-to-face support on a flexible and adaptive as-needed basis through activities such as small-group instruction, group projects, and individual tutoring." 5. The 'Flipped Classroom' Blended Learning Perhaps the most widely known version of blended learning, a 'Flipped Classroom' is one where students are introduced to content at home, and practice working through it at school supported by a teacher and/or peers. In this way, traditional roles for each space are 'flipped.' 6. Individual Rotation Blended Learning The Individual Rotation model allows students to rotate through stations, but on individual schedules set by a teacher or software algorithm. Unlike other rotation models, students do not necessarily rotate to every station; they rotate only to the activities scheduled on their playlists." 7. Project-Based Blended Learning Blended Project-Based Learning is a model in which the student uses both online learning - either in the form of courses or self-directed access - and face-to-face instruction and collaboration to design, iterate, and publish project-based learning assignments, products, and related artifacts. 111

8. Self-Directed Blended Learning In Self-Directed blended learning, students use a combination of online and face-to-face learning to guide their own personalized inquiry, achieve formal learning goals, connect with mentors physically and digitally, etc. As the learning is self-directed, the roles of ‘online learning’ and physical teachers change, and there are no formal online courses to complete. In Self-Directed blended learning, one challenge for teachers is to be able to judge the and (somehow) success of the learning experience without de-authenticating it. For students, the challenge is to seek out models of products, processes, and potential that can provide the kind of spark that can sustain learning while being self-aware enough to know what’s working and why, and to make adjustments accordingly. Some students need very little to soar, while others need support through very clear pathways that they can guide themselves through with autonomy and self-criticism. 9. Inside-Out Blended Learning In Inside-Out blended learning, experiences are planned to ‘finish’ or ‘end up’ beyond the physical classroom, but still require and benefit from the unique advantages of both physical and digital spaces. In both the Outside-In and Inside-Out models, the nature of the ‘online learning’ is less critical than the focus on platforms, spaces, people, and opportunity beyond the school walls. (The ‘online’ components could be self-directed inquiry and/or formal eLearning courses and curriculum.) Because the learning pattern is ‘outward,’ Project-Based blended learning is an excellent example of the Inside-Out model. As with Outside-In blended learning, there is a need for expert guidance, learning feedback, content teaching, and psychological and moral support from face-to-face interactions on a daily basis. Well-designed, each of the three ‘areas’ plays to its strengths and complements the other two. 10. Outside-In Blended Learning In Outside-In blended learning, experiences are planned to ‘start’ in the non-academic physical and digital environments students use on a daily basis, but finish inside a classroom. This could mean traditional letter grades and assessments forms, or less traditional teaching and learning that simply uses the classroom as a ‘closed-circuit’ publishing ‘platform’ - a safe space to share, be creative, collaborate, and give and receive feedback that grows student work. Well-designed, each of the three ‘areas’ plays to its strengths and complements the other two. While the pattern is Outside-In, unlike Remote blended learning there is still a need for guidance, teaching, and support from face-to-face interactions on a daily basis. 11. Supplemental Blended Learning In this model, students complete either entirely online work to supplement their day-to-day face-to-face learning, or entirely face-to-face learning experiences to supplement the learning gained in online courses and activities. 112
The big idea here is supplementing - critical learning objectives are met entirely in one space while the ‘opposite’ space provides the student with specific supplementing experiences that the other did not or could not provide. 12. Mastery-Based Blended Learning Students rotate between online and face-to-face learning (activities, assessments, projects, etc.) based on the completion of mastery-based learning objectives. Assessment design is crucial in any mastery-based learning experience; the ability to use face-to-face and digital assessment tools is either powerful or ‘complicated’ depending on the mindset of the learning designer. 5) Cloud Computing Cloud Computing is a shared pool of configurable computing resource (eg. networks, servers, storage, applications, and services) network on demand over the internet. Cloud computing literally, is the use of remote servers (usually accessible via the Internet) to process or store information. Access is usually using a Web browser. Save files on a server via the Internet is one example Cloud computing is the best solution to manage your applications yourself; it is a shared multi-tenant platform that is supported. When using an application running in the cloud, you simply connect to it, customize it and use it. Today, Millions of us are happy to use a variety of applications in the cloud, such as applications of CRM, HR, accounting, and even business applications. These applications based in the cloud can be operational in a few days is not possible with traditional enterprise software. They are cheap because you do not have to invest in hardware and software, or to spend money for the configuration and maintenance of complex layers of technology or to finance facilities to run them. And they are more scalable, more secure and reliable than most applications. In addition, upgrades are supported, so that your applications automatically benefit from all the improvements of safety and performance available, as well as new features. Types of Cloud Computing 1) Public Cloud: This type of infrastructure is accessible to a wide audience and belongs to a provider of "cloud services." 113

2) Private Cloud: The cloud infrastructure works for one organization. It can be managed by the company itself (Internal Private Cloud). In the latter case, the infrastructure is dedicated to the company and accessible via secure VPN-type networks. 3) The Cloud Community: The infrastructure is shared by several organizations that have common interests (e.g safety requirements, compliance ...). As private cloud, it can be managed by the organizations them selves or by third parties. 4) Hybrid Cloud: Infrastructure consists of two or more clouds (private, Community or Public), which remain unique entities but are bound together by standardized or proprietary technology, enabling data portability or applications. The Benefits of Cloud Computing (Cloud Computing) 1) Cost Reduction: Cloud computing is seen as an incremental investment, companies can save money in the long term by obtaining resources. 2) Storage Increase: Instead of purchasing large amounts of storage before the need, organizations can increase storage incrementally, requesting additional disk space on the service provider when the need is recognized. 3) Resource Pooling: In the IT industry, this feature is also known as Multi-tenancy, where many users / clients share a type and varied level of resources. 4) Highly Automated: As the software and hardware requirements are hosted on a cloud provider, IT departments sites no longer have to worry about keeping the things-to-date and available. 5) Greater Mobility: Once the information is stored in the cloud, access it is quite simple, just you have an Internet connection, regardless of where they are located. 6) Towards Green IT: By releasing the physical space, virtualization of applications and servers contributes to the reduction of equipment as well as the need for air conditioning, consequently, less energy waste. 7) Keep updated things: Similar to change the IT focus, this benefit is because of the new demands of providers cloud services, ie, the focus of providers is to monitor and maintain the most recent tools and techniques for the contractor. 8) Quick Elasticity: This characteristic has to do with the fundamental aspects of Cloud flexibility and elasticity. For example, the web shops carry a standard amount of transactions during the year, but it is necessary to increase near Christmas time. And of course these stores do not want to pay for that capacity at peak during the rest of the year. 9) Measurement Service: which means services monitored, controlled and reported. This feature allows a model of pay-per-use service, or pay for use. It has similarities with the concept of telephone service packages where you pay a standard signature to basic levels, and paid extra for the additional service, without changing the contract. 10) Change the IT focus: Once the responsibility of the computing environment has, essentially shifted to the cloud provider, IT departments can now focus more on the 114
organization's needs and the development of strategic applications and tactics and not on operational needs of the day-to-day. The limitations of Cloud Computing (Cloud Computing) The various problem areas for cloud computing environments are: 1) Security: As the data are no longer in their own organization, security becomes a major issue and questions must be answered, such as: Data is protected as adequate? There is a hacker-proof system? Can you meet the requirements regulations and government for privacy? How do you discover the leak information? Note also that corporate governance is always very concerned about the data that is stored outside the organization. 2) Location and Data Privacy: Where the data is stored? How data is stored? The provider has adequate security for data in places where they are stored? 3) Internet addiction: Since the cloud features are not available on the local network, you have to worry about the availability of the Internet. If you lose access to the Internet out, what that happens to your cloud computing environment? If your service provider increasing period unavailability, what you do with your employees and customers? What do you do in case of increased latency or delays the answers? 4) Levels of availability and service: Most organizations are familiar with the agreements service levels. The service level agreement specifies the amount of service capacity that someone has to provide, along with the penalties for not providing this level of service. How you can be sure that the cloud service provider has sufficient resources to maintain a service level agreement you signed with them? Cloud Computing Services The three major Cloud Computing Offerings are • Software as a Service (SaaS) • Platform as a Service (PaaS) • Infrastructure as a Service (IaaS) Different business use some or all of these components according to their requirement. 115

1) SaaS (Software as a Service) SaaS or software as a service is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network (internet). SaaS is becoming an increasingly prevalent delivery model as underlying technologies that supports Service Oriented Architecture (SOA) or Web Services. Through internet this service is available to users anywhere in the world. Traditionally, software application needed to be purchased upfront &then installed it onto your computer. SaaS users on the other hand, instead of purchasing the software subscribes to it, usually on monthly basis via internet. Anyone who needs an access to a particular piece of software can be subscribe as a user, whether it is one or two people or every thousands of employees in a corporation. SaaS is compatible with all internet enabled devices. Many important tasks like accounting, sales, invoicing and planning all can be performed using SaaS. 2) PaaS (Platform as a Service) Platform as a service, is referred as PaaS, it provides a platform and environment to allow developers to build applications and services. This service is hosted in the cloud and accessed by the users via internet. To understand in a simple terms, let compare this with painting a picture, where you are provided with paint colors, different paint brushes and paper by your school teacher and you just have to draw a beautiful picture using those tools. PaaS services are constantly updated & new features added. Software developers, web developers and business can benefit from PaaS. It provides platform to support application development. It includes software support and management services, storage, networking, deploying, testing, collaborating, hosting and maintaining applications. 3) IaaS (Infrastructure as a Service) IaaS (Infrastructure As A Service) is one of the fundamental service model of cloud computing alongside PaaS(Platform as a Service). It provides access to computing resources in a virtualized environment “the cloud” on internet. It provides computing infrastructure like virtual server space, network connections, bandwidth, load balancers and IP addresses. The pool of hardware resource is extracted from multiple servers and networks usually distributed across numerous data centers. This provides redundancy and reliability to IaaS. IaaS(Infrastructure as a service) is a complete package for computing. For small scale businesses who are looking for cutting cost on IT infrastructure, IaaS is one of the solutions. Annually a lot of money is spent in maintenance and buying new components like hard- drives, network connections, external storage device etc. which a business owner could have saved for other expenses by using IaaS. What is Cloud Computing Architecture? Cloud computing comprises of two components front end and back end. Front end consist client part of cloud computing system. It comprise of interfaces and applications that are required to access the cloud computing platform. 116

While back end refers to the cloud itself, it comprises of the resources that are required for cloud computing services. It consists of virtual machines, servers, data storage, security mechanism etc. It is under providers control. Cloud computing distributes the file system that spreads over multiple hard disks and machines. Data is never stored in one place only and in case one unit fails the other will take over automatically. The user disk space is allocated on the distributed file system, while another important component is algorithm for resource allocation. Cloud computing is a strong distributed environment and it heavily depends upon strong algorithm. Virtualization and Cloud Computing The main enabling technology for Cloud Computing is Virtualization. Virtualization is a partitioning of single physical server into multiple logical servers. Once the physical server is divided, each logical server behaves like a physical server and can run an operating system and applications independently. Many popular companies’ like VmWare and Microsoft provide virtualization services, where instead of using your personal PC for storage and computation, you use their virtual server. They are fast, cost-effective and less time consuming. For software developers and testers virtualization comes very handy, as it allows developer to write code that runs in many different environments and more importantly to test that code. Virtualization is mainly used for three main purposes: 1) Network Virtualization 2) Server Virtualization 3) Storage Virtualization 1) Network Virtualization: It is a method of combining the available resources in a network by splitting up the available bandwidth into channels, each of which is independent from the others and each channel is independent of others and can be assigned to a specific server or device in real time. 117

2) Storage Virtualization: It is the pooling of physical storage from multiple network storage devices into what appears to be a single storage device that is managed from a central console. Storage virtualization is commonly used in storage area networks (SANs). 3) Server Virtualization: Server virtualization is the masking of server resources like processors, RAM, operating system etc, from server users. The intention of server virtualization is to increase the resource sharing and reduce the burden and complexity of computation from users. Virtualization is the key to unlock the Cloud system, what makes virtualization so important for the cloud is that it decouples the software from the hardware. For example, PC's can use virtual memory to borrow extra memory from the hard disk. Usually hard disk has a lot more space than memory. Although virtual disks are slower than real memory, if managed properly the substitution works perfectly. Likewise, there is software which can imitate an entire computer, which means 1 computer can perform the functions equals to 20 computers. 6) Wearable Technology in Education Wearable Technology in education can increase a child's ability to more naturally interact with their environment, and to be be creative and innovative. Students can more easily access information without any obstructions. Examples of wearable technology in the classroom are: Autographer, Keyglove, Muse, VR, Smart Watches, GoPro, and Google Glass. Autographer allows students to capture students direct notes to ensure complete note taking. Keyglove are wireless gloves that are useful in gaming, design, art, music, data entry, device control, and 3D objects. Muse tracks students' brain activity onto a smartphone or tablet so that it can detect what activities they might need to keep them focused on studying. Virtual Reality gives students hands - on experience that allows students to interact with the object in that particular environment. The iPod is also an effective learning tool that empowered students to creatively think about the subject as well as to allow greater collaboration. GoPro is a camera that can capture a student or teacher's point of view of events, such as a lesson or student behavior. Finally, the Google Glass enables students and teachers to search, take a picture, record video, and answer and translate questions in a foreign language. One application would be for medical students to watch different medical procedures in real time. 7) Gamification Definition of Gamification Gamification is the use of game elements and game design techniques in non-game contexts. E.g. Nike+ - a device built into the shoe to track running, connected to a phone with applications for it, telling e.g. what is the farthest or fastest run a person has ever had, and other tracking data, as well as doing comparisons, and establishing goals and challenge sawarded with trophies and medals; friends can get involved in the form of competition or 118
encouragement. E g. Zombies Run - adding another dimension to the experience of running, a more immersive one than Nike+, but both serving a purpose which is outside of the game. Game Elements: toolbox (e.g. Empires and Allies: points, resource collection, quests, avatars, progression, levels, social graph) applied to services that are not games (e.g. Kias : progression, points, levels, rewards, quests, avatars, social graph, badges; challenges) -< regular design pattern Game Design Techniques: not only engineering, but also an artistic, experiential side, thinking about problems in a certain way, taking an approach that uses concepts common to all forms of design, as well as concepts that are novel and specific to games - game design modality -< a way of thinking Non-game context: some objective other than success in the game, other than a game for its own sake (business, learning, employment, etc.), might still be game-like, but the purpose, rationale for the experience is something outside of the game. History of Gamification 1912 - Cracker Jack with toy inside 1980 - Richard Bartle, MUD 1 - first multi-user domain/dungeon (MMOG), first shared virtual world -< took the collaboration platform and gamified it- taking something that wasn't a game and making it into one (while today it is the opposite of this: taking what is a game and turning it into something that is not) 1980 to present: research by education scholars - video games and learning - Thomas Malone, James Paul Gee 2002 to present: Serious Games Movement - Ben Sawyer, David Rejecsk - private sector, academia and the military using games for training and simulation, non-game purposes (e.g. battlefield, training mechanisms); Games For Change Movement – using games for social impact 2003 Nick Pelling, Conundria - promoting gamification of consumer products 2005: Bunch Ball 2007: first modern gamification platform incorporating mechanics like points and leader- boardsand so forth to serve engagement purposes in companies -< Badgeville, Bigdoor, Gigya e.g. Kiosk - specialized service providers offering gamification; and many companies building gamification services and systems on their own. 2010: gamification as a common term determined by the community that reached critical mass; presentations crystallized the idea of gamification for people - Jesse Schell, Schell Games, 2010 DICEConference (toothbrush, cornflakes, bus - points and bonuses, REMTARTAINMENT system); 119

JaneMcGonigal: Reality is Broken , TED talk - alternate reality games solving major human problems Why Study Gamification? • An emerging business practice (Microsoft, Nike, SAP, American Express, Major League Basketball, CodeAcademy, Samsung, Four square, Stack Overflow, Dell, LiveOps, Foot Locker, eBay, Cisco, Siemens, Universal Music, etc.) • games are powerful things: addiction, time-consuming, having a real pull • Lessons from psychology (link to some very basic aspects of how our mind works, motivation),design (how to do it), strategy (understanding how to do business, what it means to lead ...), technology (the ability to create rich immersive personalized experience and track interactions in real time, and analyze them) harder than it appears: has to be good, ethical, effective, etc. The Pyramid of Gamification Elements Marc LeBlanc, MDA Framework (Mechanics, Dynamics, Aesthetics): influential framework for understanding all games. Game Dynamics: The most high level conceptual elements, 'the grammar', the hidden structure that makes the experience somehow cohere and have regular patterns, not the same as the rules, they are more conceptual, rules can be viewed as their manifestation, conceptual kinds of elements that provide the framing for the game: 1. constraints – games create meaningful choices and interesting problems by limiting people's freedom 2. emotions – variety of emotions (games have a bigger range than gamification, because gamification happens in a real world context, and situations like getting someone really upset or abject sadness are not thing that are going to be valued) -< richer experience, emotional reinforcement 3. narrative – the structure that pulls together the pieces of the game or the gamified system into some coherent feeling whole: explicit – the storyline in a game, implicit – consistent graphical experiences, creating a sense of flow, alluding to certain kinds of particles or certain kinds of story ideas that may be in players' heads – if there is no sense of narrative, there is a risk that the gamified system will just be a bunch of abstract stuff which limits effectiveness. 120
4. Progression – the notion of starting at one place, going up along the way until you get to some higher place, giving the sense that the player will have the opportunity to improve, or at least move from where they have started; doesn't require specific examples as levels and points, but those are typical 5. relationships – people interacting with each other (friends, team mates, opponents), very important to the experience of the game. Game Mechanics: 'the verbs', the elements that move the action forward 1. challenges - objectives to reach 2. chance - luck, random result 3. competition 4. cooperation 5. feedback 6. resource acquisition - getting things to help to move forward 7. rewards 8. transactions 9. turns 10. win states Components: Lowest level, most service level kinds of game elements, specific examples, specificways to do a higher level that mechanics and dynamics represents 1. achievements – some reward attached to doing a specific set of things 2. avatars – visual representation of character 3. badges – specific visual representation of achievements, as well as of the higher level dynamics and mechanics 4. boss fights – at the end of some part of the game, a really hard challenge 5. collections – pulling a bunch of different things together 6. combat 7. content unlocking – you need to do something in order to gain access to certain new content 8. gifting 9. leader – boards – list in order of score 10. levels 11. points 12. quests – things to be done, specifically defined within the structure of the game 13. Social Graph 14. Teams 15. virtual goods 121
122

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Matching text	As the text appears in the source.

1/77	**SUBMITTED TEXT**	15 WORDS	**100%**	**MATCHING TEXT**	15 WORDS
Programmed Instruction ➢ Meaning of Programmed Instruction ➢ Principles of Programmed Instruction • Types of Programmed Instruction ➢				Programmed Instruction 4.5 Meaning of Programmed Instruction 4.6 Principles of Programmed Instruction 4.7 Types of Programmed Instruction 4.8	

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Development of Programmed Instruction ➢ Preparatory Phase (preparation of the programme) ➢ Development Phase (writing of the programme) ➢ Evaluative Phase (testing or evaluation) •

Development of Programmed Instruction 1 . Preparatory phase (preparation of the programme) 2. Development phase (writing of the programme) 3. Evaluative phase (testing or evaluation) 31

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4/77	SUBMITTED TEXT	20 WORDS	52%	MATCHING TEXT	20 WORDS

of Computer - Assisted Instruction ➢ Definitions of Computer-Assisted Instruction ➢ The origin of Computer-Assisted Instruction ➢ History of Computer - Assisted Instruction

of Computer Assisted Instructions • Identify the key characteristics and components of Computer Assisted Instruction • Analyse the various types of Computer Assisted Instruction • Critically evaluate the importance of Computer Assisted Instruction 2.1

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5/77	SUBMITTED TEXT	13 WORDS	71%	MATCHING TEXT	13 WORDS

Introduction Globalization and technological change processes that have accelerated in tandem over the past

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6/77	SUBMITTED TEXT	21 WORDS	92%	MATCHING TEXT	21 WORDS

have created a new global economy “Powered by technology, fueled by information and driven by knowledge”. The emergence of this new

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7/77	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

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learning or engineering but it should be taken as a sum total of all such aspects which 32 go a long way in shaping the personality of the learner in a meaningful context.

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is science • It studies the effect of science and technology upon education. •

is science. 2. Educational Technology studies the effect of science and technology upon education.

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10/77	SUBMITTED TEXT	18 WORDS	69%	MATCHING TEXT	18 WORDS

programmed learning, micro teaching, Simulated teaching, video tape, projector and computer etc. • It accepts school as a system. •

programmed learning, micro-teaching, simulated teaching, interaction analysis, video-tape, tape-recorder, projector and computer, etc. 5. Educational Technology accepts schools as a system.

W https://docplayer.net/47394136-B-ed-programme-university-of-kashmir-directorate-of-distance-educa ...

11/77	SUBMITTED TEXT	37 WORDS	69%	MATCHING TEXT	37 WORDS

Educational Communications and Technology (AECT) "Instructional Technology is often refereed to as a part of educational technology but the use of these terms has changed over the years. While instructional Technology covers the processes and systems of learning and

Educational Communications and Technology (AECT) Definitions and Terminology Committee. technology is often referred to as a part of educational technology but the use of these terms has changed over the years. Educational technology is the study and ethical practice of facilitating learning and

W https://www.k12academics.com/educational-technology/instructional-technology

12/77	SUBMITTED TEXT	19 WORDS	92%	MATCHING TEXT	19 WORDS

cannot solve each an every problem of education. It can be used successfully in teaching and instructional system only. •

cannot solve each and every problem of education. It can be used successfully in teaching and instructional system only. 10.

W https://docplayer.net/47394136-B-ed-programme-university-of-kashmir-directorate-of-distance-educa ...

13/77	SUBMITTED TEXT	19 WORDS	75%	MATCHING TEXT	19 WORDS

instruction, educational technology includes other systems used in the process of developing human capabilities". 4 Nature of Instructional Technology •

instruction, educational technology includes other systems used in the process of developing human History The use of instructional technology

W https://www.k12academics.com/educational-technology/instructional-technology

14/77	SUBMITTED TEXT	17 WORDS	93%	MATCHING TEXT	17 WORDS

technology: • One meaning refers to the detailed application of psychology of learning to practical teaching problems. •

SA addition.docx (D27248287)

15/77	SUBMITTED TEXT	27 WORDS	44%	MATCHING TEXT	27 WORDS

The second meaning refers to the application of engineering principles in the development of electro-mechanical equipments of such devices - pictures, tape-recorders, computers etc. These two meanings of

SA addition.docx (D27248287)

16/77	SUBMITTED TEXT	22 WORDS	81%	MATCHING TEXT	22 WORDS

Educational technology is thus the application of scientific knowledge about learning and conditions of learning to improve the effectiveness of teaching and

Educational Technology is the application of scientific knowledge about learning and conditions of learning to improve the efficiency of teaching and

W https://dodl.dibru.ac.in/wp-content/uploads/2019/06/MA-Education-201.pdf

17/77	SUBMITTED TEXT	35 WORDS	68%	MATCHING TEXT	35 WORDS

technology interact in the design and use of equipment to provide control over the learning situation, a rich array of stimulus materials (e.g., films) and interaction between responses of the learner and the presentation of instructional material.

SA addition.docx (D27248287)

18/77	SUBMITTED TEXT	30 WORDS	89%	MATCHING TEXT	30 WORDS

Educational technology is a complex integrated process involving people, procedures, ideas, devices and organisation for analysing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of learning."

Educational technology is a complex, integrated process involving people, procedures, ideas, devices and organization for analyzing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of human learning. [4] 1994

W https://educationaltechnology.net/definitions-educational-technology/

19/77	SUBMITTED TEXT	10 WORDS	100%	MATCHING TEXT	10 WORDS

successfully, educational technology consisting of various media of mass communication,

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

20/77	SUBMITTED TEXT	14 WORDS	80%	MATCHING TEXT	14 WORDS

qualitative improvement of education can be facilitated and accelerated with the help of educational technology.

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

21/77	SUBMITTED TEXT	20 WORDS	92%	MATCHING TEXT	20 WORDS

have created a new global economy powered by technology, fueled by information and driven by knowledge." The emergence of this new

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

22/77	SUBMITTED TEXT	27 WORDS	89%	MATCHING TEXT	27 WORDS

stand for information and communication technologies and is defined, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." "

stand for information and communication technologies and are defined, for the purposes, as a “diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information.”

W http://sadbhavnapublications.org/images/notes-pdffiles/edu-5e80707e87169.pdf

23/77	SUBMITTED TEXT	12 WORDS	100%	MATCHING TEXT	12 WORDS

These technologies include computers, the Internet, broadcasting technologies (radio and television), and

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

24/77	SUBMITTED TEXT	15 WORDS	100%	MATCHING TEXT	15 WORDS

communications facilities and features that variously support teaching, learning and a range of activities in education."

SA addition.docx (D27248287)

25/77	SUBMITTED TEXT	17 WORDS	91%	MATCHING TEXT	17 WORDS

is the need. • Information explosion is an ever increasing phenomena therefore there is requirement to get access

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

26/77	SUBMITTED TEXT	22 WORDS	77%	MATCHING TEXT	22 WORDS

information. • Education should meet the needs of variety of learners and teachers; therefore ICT is important in meeting this need. •

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

27/77	SUBMITTED TEXT	35 WORDS	90%	MATCHING TEXT	35 WORDS

is requirement of the society that the individuals should possess technological literacy. • We need to increase access and bring down the cost of education to meet the challenges of illiteracy and poverty -ICT is the answer

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

28/77	SUBMITTED TEXT	10 WORDS	95%	MATCHING TEXT	10 WORDS

electronic toys to develop spatial awareness and psycho-motor control; • To

SA addition.docx (D27248287)

29/77	SUBMITTED TEXT	32 WORDS	95%	MATCHING TEXT	32 WORDS

at the initial stage and then to manuscript. It is not that the teachers of this period failed to notice the importance of individual differences or motivation. But they put more emphasis on manuscript.

SA CHAPTER 02.docx (D113952053)

30/77	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

the 15th century the art of printing was developed. Books were printed.

SA CHAPTER 02.docx (D113952053)

31/77	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

religion and grammar. In the 16th century, Peter Ramus introduced text-books in higher education.

SA CHAPTER 02.docx (D113952053)

32/77	SUBMITTED TEXT	62 WORDS	76%	MATCHING TEXT	62 WORDS

John Comenius introducing text-books for children. He produced an illustrated book in 1657 – 13 "Orbus Pictures." He wrote about a hundred text-books. But the circulation was very much limited. J. Rosseau, H. Spencer, Froebel, Pesstallozi etc. helped in changing the concept of instruction and pupils. The child was put into the centre. Next came J. Dewey. He tried to introduce the scientific method in education.

SA CHAPTER 02.docx (D113952053)

33/77	SUBMITTED TEXT	59 WORDS	81%	MATCHING TEXT	59 WORDS

came John Adam's concrete-abstract continuum, i.e, define the object - show a model - diagram and then come to the verbal description III. 20th Century, in this century, we, had other sciences like sound recording, photography etc. being developed and these added to the process of learning and teaching. Even electronic transmission was advancing. And all these aided the development of educational technology.

SA CHAPTER 02.docx (D115618520)

34/77	SUBMITTED TEXT	20 WORDS	100%	MATCHING TEXT	20 WORDS

During the First World War, the testing movement started. Binet was the forefather of this movement. During the Second World War,

SA CHAPTER 02.docx (D113952053)

35/77	SUBMITTED TEXT	23 WORDS	97%	MATCHING TEXT	23 WORDS

During 1938 and 1940, the concept of visual aids helped the process of learning. It thus paved the way for audio-visual education. In 1954

SA CHAPTER 02.docx (D113952053)

36/77	SUBMITTED TEXT	18 WORDS	100%	MATCHING TEXT	18 WORDS

during the same period, Weiner studied human engineering and also worked on the science of cybernetics. By 1950, the

SA CHAPTER 02.docx (D113952053)

37/77	SUBMITTED TEXT	17 WORDS	93%	MATCHING TEXT	17 WORDS

Instructional Theories by Bruno, Glasser etc. In 1953, Gordan Pask applied the principles of cybernetics to education.

SA CHAPTER 02.docx (D113952053)

38/77	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

The educational process does not remain untouched by these advances.

The educational process does not remain untouched by these advances.

W http://sadbhavnapublications.org/images/notes-pdffiles/edu-5e80707e87169.pdf

39/77	SUBMITTED TEXT	16 WORDS	100%	MATCHING TEXT	16 WORDS

In 1970, different developments took place and the concept of Educational Technology took its shape more neatly.

SA CHAPTER 02.docx (D113952053)

40/77	SUBMITTED TEXT	14 WORDS	100%	MATCHING TEXT	14 WORDS

Educational Technology The scientific investigations of technological developments have influenced every walk of human life.

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

41/77	SUBMITTED TEXT	15 WORDS	100%	MATCHING TEXT	15 WORDS

The educational process does not remain untouched by these advances. It has necessitated introduction of

The educational process does not remain untouched by these advances. It has necessitated introduction of

W http://sadbhavnapublications.org/images/notes-pdffiles/edu-5e80707e87169.pdf

42/77	SUBMITTED TEXT	15 WORDS	75%	MATCHING TEXT	15 WORDS

It has resulted the introduction of technology in field of education. Many different approaches of technology

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

43/77	SUBMITTED TEXT	21 WORDS	100%	MATCHING TEXT	21 WORDS

Various approaches of Educational technology deliver different kinds of content and serve different purposes in the classroom. Each approach of technology

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

44/77	SUBMITTED TEXT	124 WORDS	98%	MATCHING TEXT	124 WORDS

The hardware approach refers to the use of machines and other mechanical devices in the process of education. Its origin lies in the application of “physical science” to education and training system. The process of teaching-learning has been gradually mechanized through the use of teaching machines, radio, television, tape recorder, video-tape, projectors etc. The teacher can deal with a larger group of students at the same time by his discourse through these machines. The hardware approach is based on the application of engineering principles for developing elector-mechanical equipment for instructional purposes. Motion pictures, tape recorders, television, teaching machines, computers are called educational hardware. Hardware approach mechanises the process of teaching so that teachers would be able to deal with more students with less expenditures in educating them. Human knowledge has three aspects: • Preservation, • Transmission

SA Archana AdhikaryUnit 2 technology (Block I) Paper 1046.docx (D144339383)

45/77	SUBMITTED TEXT	33 WORDS	95%	MATCHING TEXT	33 WORDS

The history of preservation of the knowledge is believed to exist since the printing machines started. The knowledge is preserved with these machines in the form of books which are shelved in the libraries,

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

46/77	SUBMITTED TEXT	294 WORDS	98%	MATCHING TEXT	294 WORDS

The second aspect of human knowledge is its transmission. A teacher can impart knowledge himself to his pupils. Now a days, transmission of the knowledge is supported by machine like mike, radio and television. With these, thousands of pupils can enjoy this home-delivery of such benefits. The third aspect of human knowledge is its development. For this aspect, provisions are made for research work. In the research programmes, the main function is the collection and analysis of data. For this purpose, presently the researcher uses the electronic machines and computers. Hence, all the three aspects of knowledge allow the use of machines. In short, the teaching process has been mechanized. The mechanization of teaching process is termed as the Hardware Approach. Basis of Hardware Approach • Hardware Approach has physical science and applied engineering as its basis. • Hardware Approach has mechanised the whole teaching-learning process. • Hardware Approach adopts a Product-oriented Approach. • Hardware Approach has the potential to hand over the educational benefits to the mass with greater ease and economy. Characteristics of Hardware Approach • Silverman, called this type of educational technology 'Relative Technology'. Based on physical science and applied engineering field approach. The concept of hardware approach is derived from the application of "physical science" toeducation. • The new mechanism of teaching-learning with improved technology as its basis. Suggesting innumerable new ways of doing things to the class-room teachers 17 • The job and the duties of the teacher are likely to have multifaceted changes as they are to deal with many new gadgets for teaching and learning . • Engineering principles are used for the development of these types of technical equipments. The teacher can deal with larger group of students with the help of these 'Mechanical device' or 'Machines'. • The teacher can deal with larger group of students with the help of these 'Mechanical device' or 'Machines', resulting in less cost and economy in

SA Archana AdhikaryUnit 2 technology (Block I) Paper 1046.docx (D144339383)

47/77	SUBMITTED TEXT	414 WORDS	97%	MATCHING TEXT	414 WORDS

The pioneering work in software approach was done by Skinner and other behaviourists. The programmes which such a technology produces are often called software. Software Approach is also termed as Instructional Technology or Teaching Technology or Behavioural Technology. It originates from behavioural sciences and their applied aspects concerning psychology of learning. The software approach used the principles of psychology for building in the learners a complex repertory of knowledge or modifying his behaviour . Psychology of learning provides solid technology for bringing desirable behavioural changes in the pupils and serves the cause of education of laying down definite instructional procedure, teaching behaviour and behaviour modification devices. Newspapers, books, magazines, educational games, flash cards may also form part of software. Software approach is characterised by task analysis, writing precise objectives, selection of appropriate learning strategies, immediate reinforcement of responses and constant evaluation. Software approach refers to the application of teaching- learning principles to the direct & deliberate shaping of behavior. Its origin lies in the application of "behavior science" to the problems of learning & motivation. Educational technology is closely associated with the modern principles & theories of teaching. Models of teaching, theory of instruction, theory of teacher- behavior & principles of programmed learning. It is characterized by task analysis, writing, objectives inbehavioral terms, selection of the appropriate teaching strategies, reinforcement for correct responses & continuous evaluation. Software Approach is concerned with teaching objectives in behavioural terms, principles of teaching, methods of teaching, reinforcement of instructional system, feedback, reviews and evaluation. Software approach tries to develop all the three basic components of technology, i.e. Input, Process and Output. Basis of Software Approach In software approach, the basis of all thinking and working is behavioural science and psychology of learning. Software approach uses the principles of psychology for the purpose of behaviour modification. A teacher with added knowledge of software approach can use the films, flashcards, tapes etc., for various purposes. A teacher can plan better teaching which results into better learning. There is not end to his thinking. 18 Characteristics of Software Approach This view of educational technology is closely associated with the modern principles of programmed learning and is characterised by task analysis, writing precise objectives, selection of appropriate learning strategies, reinforcement of correct responses and constant education. Silverman termed this educational technology as 'constructive educational technology.' Also known as 'Management Technology'. A

modern approach in educational administration and organisation. It has brought to educational management a scientific approach for solving educational administrative problems. Origin of software approach lies in the application of 'behavioural science' to the education. It refers to the application of teaching-learning principles in the shaping of behaviour. Its application while writing objectives in behavioral terms, selection of appropriate teaching, strategies, reinforcement for correct response etc

SA Archana AdhikaryUnit 2 technology (Block I) Paper 1046.docx (D144339383)

48/77 **SUBMITTED TEXT** 85 WORDS **94%** **MATCHING TEXT** 85 WORDS

Hardware Technology Software Technology 1 Has its origin in physical sciences and applied engineering. Has its origin in behavioural sciences and their applied aspects concerning psychology of learning 2 More concerned with the production and utilization of audio visual aid material and sophisticated instruments and mass media for helping teacher and learners in their task Try to make use of psychology of learning for the production and utilization of software techniques and materials in terms of learning material, teaching-learning strategies and other devices for smoothening the task of teaching learning. 3 Tries to adopt product-oriented approach, in the shape of teaching- learning material and strategy

SA Archana AdhikaryUnit 2 technology (Block I) Paper 1046.docx (D144339383)

49/77 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Tries to adopt a process-oriented technique or approach for the production of teaching- learning material and strategies. The 19

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

50/77 **SUBMITTED TEXT** 38 WORDS **86%** **MATCHING TEXT** 38 WORDS

utilization of the hardware instruments and gadgets for effective teaching learning. material produced here is made available for being used by the hardware application. 4 Based on the concept of service meaning hereby that it provides services in the field material being used by the

SA Archana AdhikaryUnit 2 technology (Block I) Paper 1046.docx (D144339383)

It helps in the production of software material being used by the hardware applications and gadgets for delivering their service to the users i.e. teachers and learners. 5 As examples of the appliances and gadgets being used in hardware technology service we can name radio, television, tape recorder, video, slides and film projectors, teaching machines and computer etc. As examples of the material produced through software technology we can name, programmed learning material, in the shape of charts, pictures, models, slides filmstrips, audio and video cassettes, software packages etc. 6 Needs the services of software technology for its use and functioning. It can't go without the aid of software technology e.g. computer hardware in the shape of a machine like device is of no use if it does not make use of software services both for its operation as a machine and its multi-dimensional utilities. The use of application and utility software is in fact must for taking any service from the hardware technology of the computer. Most useful and productive in the case if it is assisted and made into use by the hardware applications and gadgets. However, it can go alone for delivering its services to the users without calling aid from the hardware technology i.e. you can make use of programmed learning material a graph a text, etc. directly for the individualized as well as group instructions. 7 Has its mass appeal and utilization. It can contribute a lot in handing over the educational benefits to masses with greater case and economy. Has no such wide application and appeal to masses as found in the case of hardware appliances like radio, telephone, computer application, etc. 8 Has resulted in improving the efficiency of educational, means and reducing the cost of education. A teacher may handle a big class with the help of hardware appliances like microphone, slide and film projectors etc. Works for increasing the efficiency of the teachers as well as learning. However, it lags behind in the task of improving efficiency and reducing the cost of education. Role of hardware and software technologies in modern educational practices 1. Making the task of teaching-learning interest, purposeful and productive: • Suggesting suitable teaching-learning methods, devices and strategies based on psychology of teaching-learning. 20 • Suggesting suitable maxims and principle of teaching-learning based on the theory and practice of technology of teaching-learning. • Putting various types of audio-visual aid and materials and equipment at the disposal of teachers and learners. • Providing a variety of instructional and self-learning material suiting the varying needs of teaching-learning situations and individuality of the teacher and learners. 2.

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

52/77	SUBMITTED TEXT	67 WORDS	80%	MATCHING TEXT	67 WORDS

System approach is a systematic attempt to coordinate all aspects of a problem towards specific objectives. Webster's dictionary defines a system as "a regularly interacting or independent group of items forming a unified whole." The characteristics of a system of may be explained with the help of an example – various parts of the digestive system may be called as components of digestive system. Every component of the digestive system

System approach is a systematic attempt to synchronize all characteristics of a problem towards precise objectives. Webster's dictionary defines a system as "a regularly interacting or independent group of (43) items forming a unified whole." The characteristics of a system may be described with the help of an example – various parts of the digestive system may be called as mechanisms of digestive system. Every part of the digestive system

W http://ww.idolgu.in/sites/default/files/EDU_103.pdf

53/77	SUBMITTED TEXT	225 WORDS	98%	MATCHING TEXT	225 WORDS

as a whole. In the context of education, system is a unit as a whole incorporating all its aspects and parts, namely, pupils, teachers, curriculum, content and evaluation of instructional objectives. The teaching-learning process is viewed as communication and control taking place between the components of a system. In this case, the system is composed of a teacher, a student and a programme of instruction, all in a particular pattern of interaction. The System Approach focuses first upon the learner and then course content, learning experiences and effective media and instructional strategies. Such a system incorporates within itself the capability of providing continuous self-correction and improvement. It is concerned with all elements of instruction including media, including hardware and software. Its purpose is to ensure that the components of the organic whole will be available with the proper characteristics at the proper time to contribute to the total system fulfilling the objectives. In the systems approach to instruction, the teacher has to plan completely the utilization of selected resource material and the classroom activities. The teacher should have a good overall view of the subject, know his/her limitations, know all about his/her pupils and the individual differences in their learning capacities and plan accordingly. The system approach involves continuous evaluation of learning outcomes and utilization of knowledge gained by analysis of results of evaluation to suitably modify the plan of approach to achieve the stated objectives. Major steps in the systems approach in education

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

54/77	SUBMITTED TEXT	71 WORDS	97%	MATCHING TEXT	71 WORDS

Formulating of specific instructional objectives to be achieved and defining instructional goals 2. Deciding appropriate media to achieve these goals 3. Defining learner characteristics and requirements 4. Selecting appropriate methods suitable for effective learning to take place 5. Selecting appropriate learning experiences from available alternatives 6. Selecting appropriate materials and tools required 7. Assigning appropriate personal roles for teachers, students and supporting staff 8. Implementing the programme 9. Evaluating the outcome in terms of original objectives measured in student performance

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

55/77	SUBMITTED TEXT	47 WORDS	93%	MATCHING TEXT	47 WORDS

Revising to improve efficiency of the system to improve students' learning. Advantages of System Approach i. Systems approach helps to identify the suitability of the resource material to achieve the specific goal. 22 ii. Technological advance could be used to provide integration of machines, media and people for attaining the defined goal.

SA SEID-44 Technology and Disabiliy - ID.docx (D130738419)

56/77	SUBMITTED TEXT	122 WORDS	96%	MATCHING TEXT	122 WORDS

It helps to assess the resource needs, their sources and facilities in relation to quantities, time and other factors. iv. It permits an orderly introduction of components demonstrated to be required for systems success in terms of student learning. v. It avoids rigidity in plan of action as continuous evaluation affords desired beneficial changes to be made. Limitations of System Approach i. Resistance to change. Old ways are difficult to erase. There is always resistance to any new method or approach. ii. Involves hard work. Systems approach requires hard and continuous work on the part of school personnel. Some are not prepared for the extra load. iii. Lack of understanding. Teachers and administrators are still not familiar with systems approach. Though it has been successfully implemented industry, it has still to make headway in education.

It helps to assess the resource needs, their sources and facilities in relation to quantities, time and other factors. 4. It permits an orderly introduction of components demonstrated to be required for systems success in terms of student learning. 5. It avoids rigidity in plan of action as continuous evaluation affords desired beneficial changes to be made. • 17. LIMITATIONS OF SYSTEMS APPROACH •i. Resistance to change. Old ways are difficult to erase. There is always resistance to any new method or approach. •ii. Involves hard work. Systems approach requires hard and continuous work on the part of school personnel. Some are not prepared for the extra load. •iii. Lack of understanding. Teachers and administrators are still not familiar with systems approach. Though it has been successfully implemented industry, it has still to make headway in education.

W https://www.slideshare.net/atulunik/hardware-software-and-systems-approach-to-educational

57/77	SUBMITTED TEXT	14 WORDS	86%	MATCHING TEXT	14 WORDS

Communication and Principles Introduction
Communication plays an effective and essential role for running the show

SA MA 2nd Sem, Paper-4, Block-1.pdf (D165200502)

58/77	SUBMITTED TEXT	92 WORDS	93%	MATCHING TEXT	92 WORDS

informal teaching- learning process. In many ways, teaching is communicating and in this sense good teachers are always good communicators. It is also equally true for the learners. He who learns well is the one who participates well in the communication process. Good learners are always good receivers and responders. In this way, communication as a vehicle or tool for running the show of teaching - learning act, must always be treated as a two way process in which both the source(teacher) and the beneficiary(learner) of teaching interact well for the proper realization of the teaching-learning objectives.

SA MA 2nd Sem, Paper-4, Block-1.pdf (D165200502)

59/77	SUBMITTED TEXT	51 WORDS	86%	MATCHING TEXT	51 WORDS

Communication, in its literal sense, stands for the act of communicating. One can communicate his ideas, thoughts, feelings, etc or transfer any type of information and knowledge to others through this act. For this purpose, he may also take the help of some instruments, appliances, or devices like telephone, teleprinter, telegram, radio broadcasting

SA MA 2nd Sem, Paper-4, Block-1.pdf (D165200502)

60/77	SUBMITTED TEXT	15 WORDS	100%	MATCHING TEXT	15 WORDS

Programmed Instruction ➢ Meaning of Programmed Instruction ➢ Principles of Programmed Instruction • Types of Programmed Instruction ➢

Programmed Instruction 4.5 Meaning of Programmed Instruction 4.6 Principles of Programmed Instruction 4.7 Types of Programmed Instruction 4.8

W https://docplayer.net/47394136-B-ed-programme-university-of-kashmir-directorate-of-distance-educa ...

61/77	SUBMITTED TEXT	32 WORDS	89%	MATCHING TEXT	32 WORDS

telecasting. In this sense, communication may be taken as a one - sided transaction of a piece of information, knowledge, ideas, thoughts and feelings from a person to another person or persons at

SA MA 2nd Sem, Paper-4, Block-1.pdf (D165200502)

62/77	SUBMITTED TEXT	22 WORDS	100%	MATCHING TEXT	22 WORDS

Development of Programmed Instruction ➢ Preparatory Phase (preparation of the programme) ➢ Development Phase (writing of the programme) ➢ Evaluative Phase (testing or evaluation) •

Development of Programmed Instruction 1 . Preparatory phase (preparation of the programme) 2. Development phase (writing of the programme) 3. Evaluative phase (testing or evaluation) 31

W https://ncte.gov.in/oer/Forms/OERDocs/OERDoc/OERDoc_348_34375_10_08_2021.pdf

63/77	SUBMITTED TEXT	21 WORDS	54%	MATCHING TEXT	21 WORDS

of Computer - Assisted Instruction ➢ Definitions of Computer-Assisted Instruction ➢ The origin of Computer-Assisted Instruction ➢ History of Computer - Assisted Instruction Introduction

of Computer Assisted Instructions • Identify the key characteristics and components of Computer Assisted Instruction • Analyse the various types of Computer Assisted Instruction • Critically evaluate the importance of Computer Assisted Instruction 2.1 Introduction

W https://dodl.dibru.ac.in/wp-content/uploads/2019/06/MA-Education-201.pdf

64/77	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

Linear or Extrinsic Programming ➢ Branching or intrinsic Programming ➢ Mathetics programming •

SA ED-001.docx (D161176864)

65/77	SUBMITTED TEXT	842 WORDS	99%	MATCHING TEXT	842 WORDS

Origin of Programmed Instruction Although attempts at processes resembling programmed instruction date back to the 1920s (Pressey, 1926), the actual term is probably derived from B. F. Skinner's (1954) paper, "The Science of Learning and the Art of Teaching," presented at the University of Pittsburgh's conference of Current Trends in Psychology and the Behavioural Sciences on March 12, 1954. Skinner's remarks reflected his reaction to a 1953 visit to his daughter's fourth-grade arithmetic class (Vargas and Vargas, 1992). Skinner (1954, pp. 90–91) argued that schools were unable to accomplish the type of teaching that eventually leads to original thinking because: • Schools relied on aversive stimulation or control; as Skinner described it, children worked to "avoid or escape punishment." • Schools did not pay attention to the contingencies of reinforcement. • Schools lacked a systematic plan for learning skills, or, in Skinner's words, "a skillful program which moves forward through a series of progressive approximations to the final complex behaviour desired." • Schools too infrequently provided reinforcement. Skinner suggested a systematic plan – or programmed instruction – as the vehicle to accomplish the changes that needed to occur in classrooms, and in his description of that plan he made two statements that illustrate the importance of instructional design and its relationship to technology. He stated that "education is perhaps the most important branch of scientific technology" (1954, p. 93), and "in the present state of our knowledge of educational practices, scheduling [of behaviors and consequences] appears to be most effectively arranged through the design of the material to be learned" (p. 94, emphasis added). Skinner was at the forefront in articulating the need to accomplish this scheduling of behaviors and consequences and a program for effective and efficient learning through operant conditioning. Operant conditioning is a form of conditioning that reinforces desired behaviour and it is this behaviourist theory that forms the basis for programmed instruction. During the 1950s, educators and psychologists became concerned that the mass schooling precipitated by increasing demands on public education were not meeting an individual's needs for personal attention in the learning process, and they suggested that teaching machines could restore the "important features of personal instruction" (Skinner, 1986, p. 103). Additional teaching machines were introduced in the 1960s, largely as a result of the success of programmed instruction. A variety of simple machines were introduced, including Skinner's teaching machine, the Porter device, the Bell device, the punchboard, the Subject Matter Trainer by Briggs, the Arithmetic Machine by Skinner and Zeaman, and the Polymath by Rothkopf (Ysewijn, 1993). During the 1970s and 1980s, as the first computers were being placed in the classrooms of many

Origin of Programmed Instruction Although attempts at processes resembling programmed instruction date back to the 1920s (Pressey, 1926), the actual term is probably derived from B. F. Skinner s (1954) paper, The Science of Learning and the Art of Teaching, presented at the University of Pittsburgh s conference of Current Trends in Psychology and the Behavioral Sciences on March 12, Skinner s remarks reflected his reaction to a 1953 visit to his daughter s fourth-grade arithmetic class (Vargas and Vargas, 1992). Skinner (1954, pp) argued that schools were unable to accomplish the type of teaching that eventually leads to original thinking because: Schools relied on aversive stimulation or control; as Skinner described it, children worked to avoid or escape punishment. Schools did not pay attention to the contingencies of reinforcement. Schools lacked a systematic plan for learning skills, or, in Skinner s words, a skillful program which moves forward through a series of progressive approximations to the final complex behavior desired. Schools too infrequently provided reinforcement. Skinner suggested a systematic plan or programmed instruction as the vehicle to accomplish the changes that needed to occur in classrooms, and in his description of that plan he made two statements that illustrate the importance of instructional design and 70 75 its relationship to technology. He stated that education is perhaps the most important branch of scientific technology (1954, p. 93), and in the present state of our knowledge of educational practices, scheduling [of behaviors and consequences] appears to be most effectively arranged through the design of the material to be learned (p. 94, emphasis added). Skinner was at the forefront in articulating the need to accomplish this scheduling of behaviors and consequences and a program for effective and efficient learning through operant conditioning. Operant conditioning is a form of conditioning that reinforces desired behavior and it is this behaviorist theory that forms the basis for programmed instruction. During the 1950s, educators and psychologists became concerned that the mass schooling precipitated by increasing demands on public education were not meeting an individual s needs for personal attention in the learning process, and they suggested that teaching machines could restore the important features of personal instruction (Skinner, 1986, p. 103). Additional teaching machines were introduced in the 1960s, largely as a result of the success of programmed instruction. A variety of simple machines were introduced, including Skinner s teaching machine, the Porter device, the Bell device, the punchboard, the Subject Matter Trainer by Briggs, the Arithmetic Machine by Skinner and Zeaman, and the Polymath by Rothkopf (Ysewijn, 1993). During the 1970s and 1980s, as the first computers were being placed in the classrooms of many

schools, behavioural theories became quite popular. Advances in programming and computer technology also spurred the popularity of programmed instruction by making it 45 possible to teach a wide range of topics and skills. During this period programs for nearly every topic covered in a traditional school curriculum (i.e., math, science, language arts, social studies) were written for a variety of teaching machines (which eventually gave way to the personal computer) (Chen, 2006).Programmed instruction is now generally considered to be one appropriate instructional approach among many, and most appropriately utilized in conjunction with a variety of other instructional methods. Meaning of Programmed Instruction Programmed instruction / learning simply means learning performed or instruction provided by a teaching Machine or programmed textbooks. In order to understand the meaning of programmed instruction we will through light on some definitions of programmed instruction put forward by different scholars: Smith and Moore (1962): Programmed instruction is the process of arranging the material to be learned into a series of sequential steps, usually it moves the students from a familiar background into a complex and new set of concepts, principles and understanding. Leith (1966): Programmed is a sequence of small steps of instructional material (called frames), most of which require a response to be made by completing a blank space in a sentence. To ensure that expected responses are given, a system of queuing is applied and each response is verified by the provision of immediate knowledge of result. Such a sequence is intended to be worked at the learners own pace as individualized self instruction. Jacobs and et al (1966): Self-instructional programmes are educational materials from which the students learn. These programmes can be used with many types of students and subject matter, either by themselves, hence the name "self-instruction" or in combination with other instructional techniques. Espich and Williams (1967): Programmed instruction is a planned sequence of experiences, leading to proficiency in terms of stimulus responses relationship, that have proven to be effective. Susan Markle (1969): It is a method of designing a reproducible sequence of instrumental events to produce a measurable and consistent effect on the behaviour of each and every acceptable student. Gulati and Gulati (1976): Programmed learning, as popularly understood, is a method of giving individualized instruction, in which the student is active and proceeds at his own pace and is provided with immediate knowledge of results. The teacher is not physically present. The programmer, while developing programmed material, has to fallow the laws of behaviour and validate his strategy in terms of student learning. Owing the above definitions we came to the conclusion that Programmed instruction / learning is a systematically planned, empirically established and effectively controlled self-instructional technique for

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providing individualized instruction to the learner through logically sequenced small segments of the subject matter by using the principles of operant conditioning and schedules of reinforcement. 46

effectively controlled self-instructional technique for providing individualized instruction to the learner through logically sequenced small segments of the subject matter by using the principles of operant conditioning and schedules of reinforcement. 4.6

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66/77 **SUBMITTED TEXT** 46 WORDS **100%** **MATCHING TEXT** 46 WORDS

is defined as a systematic application of reinforcement theory to the analysis and construction of complex repertoires which represent the mastery in subject matter. It is based on connectivist theory of learning. It is a reverse chaining approach. It is based on Principle of chaining, Discrimination and Generalization.

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67/77 **SUBMITTED TEXT** 150 WORDS **99%** **MATCHING TEXT** 150 WORDS

Mathetics programming is based on following assumptions. 1. Chaining of responses helps in learning to reach up to mastery level. 2. Reverse chaining of stimuli helps in learning, i.e. from whole to part, from Complex to simple. 3. Completion of task provides motivation to students. Frames size is organized in small step but in a reverse chain i.e. from complex content to its small, simple units to attain mastery level; Frame structure is based on Demonstration- prompts-release. There are two types of frames: 1. Demonstration frames 2. Prescription frames. Responses are structured responses and responses determined by the programmer. Completion of task provides reinforcement. Wrong responses are ignored. Error helps in discrimination but not in learning. Its main purpose is to develop mastery of the content. Main 50 focus is on Mathematics and grammar. It used for higher classes useful for complex and difficult task. It is useful for developing concepts of mathematics and grammar. It can be used in Distance Education. Advantages of Mathetics Programming: 1.

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68/77 **SUBMITTED TEXT** 39 WORDS **92%** **MATCHING TEXT** 39 WORDS

Limitations of Mathetics Programming: 1. Main emphasis is on mastery of the content rather than changes in behaviour of the learner. 2. Retrogressive chaining of stimuli if not effective for terminal behaviour. 3. It is very difficult to develop retrogressive learning package. 4.

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69/77	SUBMITTED TEXT	34 WORDS	79%	MATCHING TEXT	34 WORDS

It is very technical in nature and such as demands a lot of skill, training and labour on the part of the programmer. 5. It is not suitable for learning the material of all subjects. 6.

It is very mechanical in nature and as such demands a lot of expertise, training and labour on the part of the programmer. (ii) It is not fit for learning the material of all subjects.

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70/77	SUBMITTED TEXT	109 WORDS	98%	MATCHING TEXT	109 WORDS

learning theory. Development of Programmed Instruction The development of the programmed instruction material in the form of programmed text or computer-assisted instruction is a highly specialized job. The task involves the following main phases: 1. Preparatory Phase (preparation of the programme) 2. Development Phase (writing of the programme) 3. Evaluative Phase (testing or evaluation) 1) Preparatory Phase The preparatory phase occupies a very prominent place, in any scheme of the development of the programmed instructional material. It includes the planning and beginning. The experts of programmed instruction are of the opinion, that almost 25 percent time should be spent for the execution of the activities concerning this phase. In general, the following activities or steps are to be executed during this phase:

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Assortment of the Content / topic or units to be programmed The primary job of a programmer is that, he should concentrate on the wise selection of the topic or unit for his programming. The selection of the topic or content to be programmed should meet the following criteria: 1. Is any programme already available on the topics? 51 2. What are the difficulties that the topic cannot be taught by other already available methods? 3. Does it allow developing a simple, logical and systematic programme quite interesting useful and suitable from the angle of the learner? 4. Does it suites to the curriculum needs of the learner? 5. Whether the teacher has got the required specialization on the subject. 6. Does it really help in curtailing the teacher's burden? 7. Does it allow for setting the real and useful objectives in behavioural terms and design a criterion test to measure the outcomes of the results of the programmed learning? 8. Is it within the economic conditions of the people concerned. b) Describing the learners The programme is meant for the learners. Therefore, a programmer should know and describe the characteristics of the learners in terms of their age, gender, socio- economic and cultural background, intellectual level, interest, general scholastic abilities, aptitudes, previous experience potential of learning, etc. For this purpose, he may take the help of his own experience cumulative record and various other testing devices, interest inventory, aptitude tests, intelligence tests, achievement tests, diagnostic tests, etc. And conclude about the characteristics of the learners. c) Detecting objectives in behaviour terms The programmer has to set the definite instructional objectives for deriving the desired results, these objectives should be stated clearly in behavioural terms, or he should state clearly the type and extent of the behavioural changes to be expected from the learners after going through the developed programme. It is this description of the terminal behaviour of the learners that is aimed at in writing the instructional objects. The minimum requirement is this regard are mentioned below. i. Initially, the programmer has to select the domain – cognitive, effective or psychomotor of the behaviour for which the behavioural changes are to be sought. ii. The programmer has to take decision about adopting a particular approach, such as Mager's, Miller's or R.C.E.M. for writing instructional objectives in behavioural terms. While the Mager's approach serves the purpose of cognitive and affective objectives, the Miller's approach is meant for psychomotor objectives, and the R.C.E.M. approach can serve the objective belonging to all the three domains of the behaviour. Each approach has its own taxonomy (system of classification) of education objectives. iii. For writing an objective of a particular domain, suitable action verbs or mental processes are picked up from the list of action verbs or mental

processes format in relation to the particular topic or content portion to be taught. The objectives can be written in behavioural terms by combining action verbs (in the case of Mager's or Miller's approach) or mental process (in the case of the R.C.E.M. approach) with the content. 52 d) Entry behaviour of the learners The objectives and their statements in behavioural terms point out the finishing point or terminal behaviour of the learners as a result of the given programmed instruction. However, one has to start with something for aiming to end with the terminal behaviour. This starting point with respect to one's behaviour is called his entry behaviour – the initial behaviour. Before going through the programmed instruction, this behaviour – like terminal behaviour – to be stated in clear terms so that the programmer may be very much clear about the programmed instructional material developed by him. Here, one has to describe the behaviour of the learner in terms of the prerequisite knowledge, skills, interest attitudes, etc. as illustrated below: Before going through the present programmed the learner is able to ..... Read/write/ define/observe/calculate/..... With ..... Efficiency or in ..... circumstances. e) Developing specific outlines of content The course content to be covered through the programme are decided on the basis of basic assumptions about the learners, their entry behaviour, objectives to be realized in the form of terminal behaviour, and the courses of study prescribed to them by authorities like Boards of School Education, and Universities. At the planning stage, the programmer is supposed to develop specific outlines of the related course contents. The course content is developed on the basis his own experience and observation of the related course, analysis of the curriculum, and consultation and help from subject matter experts and experienced teacher. After collecting the content material from the sources, the programmer may go ahead for preparing the outlines. This can be done in two ways: logically or psychologically Whereas logic demands systematic and orderly treatment of the subject, psychology advocates the arrangement that appeals to the basic interests and abilities of the learners. The programmer must try to organize the contents in such a way that it can suit both the purposes, i.e. logical and systematic treatment of the subject, based on the psychological requirement of the learners.

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72/77	SUBMITTED TEXT	235 WORDS	99%	MATCHING TEXT	235 WORDS

Computer - Assisted Instruction Meaning of Computer - Assisted Instruction: A revolutionary change in information technology has resulted in the production of innovation to simplify and ameliorate student's learning. The greatest contribution of cyber age technology is the development of computer and its use in all walks of life. Computers are fundamental for the rapid flow of information and are responsible in bringing revolution in the field of education. Use of computers in teaching-learning process has stepped many stages of its evolution. Computers have become the basis for data processing technologies used in realizing information production, manipulating, storing, and distributing processes. They reach more senses compared to other technological tools and make abstract and complicated concepts concrete digitally. Because of their extensive multimedia properties, they are considered as one of the most important technological tools and are used in educational and instructional process. Computers play an influential part in accomplishing many pedagogical functions such as measuring and evaluating knowledge and giving feedback, observing activities and performances of students. Being independent from time and environment, computers motivates the students and helps them in active participation, considers individual differences, regulates education level according to existing knowledge and progress of the students, and presents the learning instructions by using graphics, pictures, animation and sound. The computer technology has a deep impact on education. 59 Computers facilitate an efficient storage and effective presentation of information. Presentation software like Powerpoint and animation software like flash, 3D studio and others can be a great help to the teachers while delivering information.

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turn out being a brilliant aid in teaching and making the process of learning interactive and interesting. Computer-Assisted Instruction (CAI) is among the range of strategies being used to improve student achievement in school subjects. Programs for CAI have come a very long way since they were first developed over two decades ago. These programs tutor and drill diagnose student's problems; keep records of student progress, and present material in print and other manifestations. It is believed that they reflect what good teachers do in the classroom. Computer-Assisted Instruction (CAI) is an interactive instructional method that uses a computer to present material, track learning, and direct the user to additional material, which meets the student's needs. In CAI, information presented on computers in the form of text or in multimedia formats, including photographs, videos, animation, speech, and music help in increasing active participation of the students in teaching-learning process. Computers help students in visualizing abstract objects. Examples of CAI applications include guided drill and practice exercises, computer visualization of complex objects, and computer-facilitated communication between students and teachers. CAI tools, such as word processors, spreadsheets, and databases, collect, organize, analyze, and transmit information. They also facilitate communication among students, between students and instructors, and beyond the classroom to distant students, instructors, and experts. In short, Computer-Aided Instruction(CAI) or Computer-Assisted Instruction (CAI) is diverse and rapidly expanding spectrum of computer technologies that assist the teaching-learning process. Definitions of Computer-Assisted Instruction: Locatis and Atkinson (1984) describe Computer-assisted instruction as a mode of instruction that involves student's interaction with the computer directly. Typically, students access program presented in segments, with each segment

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and questions or problems for student's response. The correctness of each response is indicated immediately and remedial or new information is presented. Sometimes students also have the option to requesting help or skipping ahead. Although this tutorial (information-practice-feedback) form of CAI is most typical, there are other forms such as drill and practice exercise, simulations and games. Computer-Assisted Instruction is described and defined by Frenzel (1986) as the process by which written and visual information is presented in a logical sequence to a student by a computer. The computer serves as an audio-visual device. The students learn by reading the material presented or by observing the graphic information displayed. The primary advantage of the computer over other audiovisual devices is the automatic interaction and feedback that the computer can provide. Steinberg (1991) defines CAI as computer presented instruction that is individualized, interactive and guided. He is of the view that CAI is not a method of instruction. Many methods are implemented in it, including direct and exploratory lessons, drill, games and simulations. 60 Poole (1995) defined computer-assisted instruction as a computer-based system designed to help students learn subject matter of all kind. According to Munden (1996) computer assisted instruction is an educational medium in which instructional content or activities are delivered by a computer. Students learn by interaction with the computer and appropriate feedback is provided. Roblyer and Edwards (2000) defines CAI as software designed to help teach information and /or skills related to a topic also known as courseware. All the definitions of computer assisted instruction presented above agree that computer plays a role of tutor and imparts instructions either through tutorials or simulations or any other mode of presentation. Use of computer in education is referred by many names such as: • Computer Assisted Instruction (CAI) • Computer aided Instruction (CAI) • Computer Assisted Learning (CAL) • Computer Based Education (CBE) • Computer Based Teaching (CBT) • Computer Based Instruction (CBI) • Computer Enriched Instruction (CEI) • Computer Managed Instruction (CMI) Computer-Assisted Instruction (CAI) or Computer-Aided Instruction (CAI) is a narrower term and most often refers to drill-and-practice, tutorial, or simulation activities. It is one of the components of computer based training (CBT). Computer- Managed Instruction (CMI) is an instructional strategy whereby the computer is used to provide learning objectives, learning resources, record keeping, progress tracking, and assessment of learner performance. Computer based tools and applications are used to assist the teacher or school administrator in the management of the learner and instructional process. CBT contains the following three components:- •

Computer Assisted Instruction (CAI) • Computer Managed Instruction (CMI) • Computer Supported Learning Resources (CSLR) 61 The origin of Computer-Assisted Instruction The origin of Computer-Assisted Instruction traces back to early decade of twentieth century, when behavioural theories were being embedded and implicated in educational institutions. The fundamental idea of programmed self-instructional material was described in 1912 by Thorndike. The Greek philosopher Socrates is said to be the first programmer who developed a program in Geometry, which was recorded by his disciple Plato in the dialogue Meno. Socrates used to teach his followers by raising questions and leading them towards facts and insights through conversation. In the written form conversation seems to have some characteristics of linear programmed text such as: • Questions arranged so as to make the students conscious about ignorance and move towards deeper understanding • Indications to illustrate correct response • Immediate feedback • Praise for correct response According to Wang and Sleeman(1993) the origin of Computer-Assisted Instruction was traced back in 1924 where Sidney L. Pressy had invented a multiple choice items scoring machine further followed by B. F. Skinner s work to improve and expand the idea in 1950s and 1960s. " During 1960s the Computer-Assisted Instruction was developed and used at a few university military traced centers and corporation in the United States. The early efforts were designed for providing individualized interactive instruction to learners simultaneously. Computer-Assisted Instruction (CAI) is based on the principles of programme instruction. The major aim of programme instruction is to provide individualized instruction to meet the special needs of the individual learner. Computer-Assisted Instruction (CAI) is relatively a new field in which the pioneer efforts were made around 1960s. A number of large scale heavily funded Computer-Assisted Instruction (CAI) projects have been launched and implemented. Chambers and Sprecher (1983) defined CAI as "the use of computer to provide course content instruction in the form of drill and practice, tutorial and simulations". History of Computer - Assisted Instruction Hall(1971) stated that the earliest attempts to automate instruction were initiated by Sidney Pressey in the early 1900s and by B. F. Skinner in 1954. Both Pressey and Skinner developed techniques of administering instructional materials to students through programmed text" (p. 629). The programmed text and teaching machines were very inadequate to provide a stimulating, responsive environment for students. "The obvious limitations of these devices prompted investigation of applying computers to instructional tasks". According to (Suppes and Macken, 1978) members of the computer industry were also among the earliest to use computer-assisted instruction. In the late 1950s, the computer industry used computer-assisted instruction to

train its own personnel by linking typewriters and teletypes terminals to computers. The programming language used during these training was obscure and quite hard for people to learn. Because of the complexity of the programming language, ways of simplifying such programming were explored. 62 By 1960, International Business Machines (IBM) developed the first computer-assisted author language, Course writer I. Educators were then able to directly program their curriculum ideas into the system During the 1960s the University of Illinois engaged in a computer-assisted project, PLATO (Programmed Logic for Automatic Teaching Operations), in connection with Control Data Corporation and the National Science Foundation.

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PLATO was one of the largest and most sophisticated computer systems designed for education. In 1963, a Computer-Assisted Instruction research project began at Stanford University. The Institute for Mathematical Studies in the Social Sciences (IMSSS) at Stanford University developed an instructional mathematical program for elementary students. The program was developed and tested in 1964. In 1966, IBM developed the first computer system specifically for instructional purposes, the 1500 Instructional System. The programs and systems developed in the early 1950s and 1960s used an electric typewriter or a teletype terminal through which students received information from the computer. The student, in turn, transmitted information to the computer. After the development of the 1500 Instructional System, most systems utilized television screens as the major display for students. Students fed responses to the program or system by the use of a typewriter keyboard. The use of random-access audio, playback/record capability, and random-access image projectors, all under program control, accompanied more complete instructional systems. In the early 1970s, computer-assisted instruction was being implemented in different ways. A unique computer-assisted instruction program, Computer-Assisted Remediation and Evaluation (CARE), was designed to help classroom teachers identify children with particular mental handicaps that would adversely affect their academic progress. The CARE project was a self-contained college level course. The special feature of this computer-assisted instruction program was the method of dissemination. A mobile CAI unit was driven to teachers who requested the program. By 1972, the unit served teachers in Maryland, Pennsylvania, Texas, and Washington, D.C. In 1972, the Mitre Corporation of Bedford, Massachusetts and C. Victor Bunderson and associates at Brigham Young University developed the Time-Shared; Interactive, Computer- Controlled, Information Television (TICCIT).The TICCIT combined mini-computers and television receivers in an instructional system with the display capabilities of color televisions. The aim of the TICCIT program was to provide a complete and independent alternative to entire college courses in selected subjects Suppes and Macken (1978) noted that the purpose of the TICCIT system was to use minicomputers and television technology to deliver computer- assisted lessons and educational programs in English and mathematics to community college students. The TICCIT lesson was displayed on a color television screen connected to a keyboard and a local computer where students could respond. One TICCIT system could serve 128 terminals (Kuliket al., 1980) . Rota (1981) stated the TICCIT system lessons were developed and designed by an assembled team of experts; whereas, the PLATO lessons were designed by

teachers. According to Rota (1981), "The PLATO and TICCIT projects were succeeded in introducing effective computer - assisted systems into schools. Each project led to the development and reliable operation of computer systems dedicated to instruction. The PLATO system supported hundreds of active terminals, and it gave each site a powerful tool for teaching. The TICCIT system had the display capabilities of television and employed an 63 innovative instructional design. Schools accepted these systems as additional resources for promoting student learning and as a part of the approved curriculum", (p. 14). In addition, Kulik, Kulik, and Cohen (1980) stated that the evaluations of PLATO and TICCIT gave educators additional perspectives on computer-based college teaching and demonstrated that this teaching approach would be accepted in institutions of higher education as an additional resource for promoting student learning. In 1975, the Computer Curriculum Corporation (CCC) was developed to offer a large variety of courses for elementary through junior college students. The CAI system consisted of an instructional computer that provided individualized lessons to as many as 96 teletype terminals simultaneously. The computer and terminal were located at the school site, and neighbouring sites were then linked to the computer via telephone lines. According to Rota (1981), the PLATO and TICCIT systems opened the gateway in the potential of a technology market in education. Recently, the use of technology in education and classroom teaching has increased across a variety of disciplines. In many cases, the use of multimedia instruction has proved to be effective. Students may get benefits from CAI. It provides better and more comfortable learning for students, since they learn at their own pace and convenience; get opportunities to work with vastly superior materials and more sophisticated problems; personalized tutoring; automatic measurement of progress; and others. Teachers also gain from CAI, as they experience less drudgery and repetition, greater ease in updating instructional materials, more accurate appraisal

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76/77	SUBMITTED TEXT	769 WORDS	98%	MATCHING TEXT	769 WORDS

Interactive Technologies The new systems have varying degrees of interactivity - the capability to talk back to the user. They are enabling and satellites, computers, teletext, view data, cassettes, cable, and videodiscs all fit the same emerging pattern. They provide ways for individuals to step out of the mass audiences and take an active role in the process by which information is transmitted. The new technologies are de-massified so that a special message can be exchanged with each individual in a large audience. They are the opposite to mass media and shift control to the user. Many ae asynchronous and can send or receive a message at a time convenient for individuals without being in communication at the same time. This overcomes time as a variable affecting communication. A video, data and voice delivery system reduces travel costs. When the material is retrieved and saved to a video tape or disc, the material can be used at anytime or anyplace. As more interactive technologies emerge, the value of being an independent learner will increase. Research shows that learning from new technologies is as effective as traditional methods. Large groups are cost-effective and everyone gets the same information. 76 b) Types of Teleconferences 1) Audio Teleconference: Voice-only; sometimes called conference calling. Interactively links people in remote locations via telephone lines. Audio bridges tie all lines together. Meetings can be conducted via audio conference. Preplanning is necessary which includes naming a chair, setting an agenda, and providing printed materials to participants ahead of time so that they can be reviewed. Distance learning can be conducted by audio conference. In fact, it is one of the most underutilized, yet cost effective methods available to education. Instructors should receive training on how to best utilize audio conferences to augment other forms of distance learning. 2) Audio graphics Teleconference: Uses narrowband telecommunications channels to transmit visual information such as graphics, alpha-numerics, documents, and video pictures as an adjunct to voice communication. Other terms are desk-top computer conferencing and enhanced audio. Devices include electronic tablets/boards, freeze-frame video terminals, integrated graphics systems (as part of personal computers), Fax, remote-access microfiche and slide projectors, optical graphic scanners, and voice/data terminals. Audiographics can be used for meetings and distance learning. 3) Computer Teleconference: Uses telephone lines to connect two or more computers and modems. Anything that can be done on a computer can be sent over the lines. It can be synchronous or asynchronous. An example of an asychronous mode is electronic mail. Using electronic mail (E-Mail), memos, reports, updates, newsletters can be sent to anyone on the local area network (LAN) or wide area network (WAN).

Interactive Technologies The new systems have varying degrees of interactivity - the capability to talk back to the user. They are enabling and satellites, computers, teletext, cassettes, cable, and videodiscs all fit the same emerging pattern. They provide ways for individuals to step out of the mass audiences and take an active role in the process by which information is transmitted. The new technologies are demassified so that a special message can be exchanged with each individual in a large audience. They are the opposite o mass media and shift control to the user. 177 Many are asynchronous and can send or receive a message at a time convenient for individuals without being in communication at the same time. This overcomes time as a variable affecting communication. A video, data and voice delivery system reduces travel costs. When the material is retrieved and saved to a video tape or disc, the material can be used at anytime or anyplace. As more interactive technologies emerge, the value of being an independent learner will increase. Research shows that learning from new technologies is as effective as traditional methods. Large groups are cost-effective and everyone gets the same information. Types of Teleconferences Audio Teleconference: Voice-only; sometimes called conference calling. Interactively links people in remote locations via telephone lines. Audio bridges tie all lines together. Meetings can be conducted via audio conference. Preplanning is necessary which includes naming a chair, setting an agenda, and providing printed materials to participants ahead of time so that they can be reviewed. Distance learning can be conducted by audio conference. In fact, it is one of the most underutilized, yet cost effective methods available to education. Instructors should receive training on how to best utilize audio conferences to augment other forms of distance learning. Audio-graphics Teleconference: Uses narrowband telecommunications channels to transmit visual information such as graphics, alpha-numerics, documents, and video pictures as an adjunct to voice communication. Other terms are desk-top computer conferencing and enhanced audio. Devices 178 include electronic tablets/boards,freeze-frame video terminals, integrated graphics systems (as part of personal computers), Fax, remote-access microfiche and slide projectors, optical graphic scanners, and voice/data terminals. Audio-graphics can be used for meetings and distance learning. Computer Teleconference: Uses telephone lines to connect two or more computers and modems. Anything that can be done on a computer can be sent over the lines. It can be synchronous or asynchronous. An example of an asychronous mode is electronic mail. Using electronic mail (E-Mail), memos, reports, updates, newsletters can be sent to anyone on the local area network (LAN) or wide area network (WAN).

Items generated on computer which are normally printed and then sent by facsimile can be sent by E-Mail. Computer conferencing is an emerging area for distance education. Some institutions offer credit programs completely by computer. Students receive texts and workbooks via mail. Through common files assigned to a class which each student can assess, teachers upload syllabi, lectures, grades and remarks. Students download these files, compose their assignment and remarks offline, then upload them to the common files. Students and instructors are usually required to log on for a prescribed number of days during the week. Interaction is a large component of the students' grades. Through computers, faculty, students and administrators have easy access to one another as well as access to database resources provided through libraries. The academic resources of libraries and special resources can be accessed such as OCLC, ERIC, and Internet. Administrators can access student files, retrieve institutional information from central repositories such as district or system offices, government agencies, or communicate with one another. Other resources can be created such as updates on state or federal legislation. 4) Video Teleconference: Combines audio and video to provide voice communications and video images. Can be one-way video/two-way audio, or two-way video/two-way audio. It can display anything that can be captured by a TV camera. The advantage is the capability to display moving images. In two-way audio/video systems, a common application is to show people which creates a social presence that resembles face-to-face meetings and classes and enables participants to see the facial expressions and physical demeanor of participants at 77 remote sites. Graphics are used to enhance understanding. There are three basic systems: freeze frame, compressed, and full-motion video. Video conferencing is an effective way to use one teacher who teaches to a number of sites. It is very cost effective for classes which may have a small number of students enrolled at each site. In many cases, video conferencing enables the institution or a group of institutions to provide courses which would be cancelled due to low enrollment or which could not be supported otherwise because of the cost of providing an instructor in an unusual subject area. Rural areas benefit particularly from classes provided through video conferencing when they work with a larger metropolitan institution that has full-time faculty. Through teleconferencing, institutions are able to serve all students equitably. Why Use a Teleconference?

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77/77	SUBMITTED TEXT	56 WORDS	95%	MATCHING TEXT	56 WORDS

of student progress, and more time to work directly with students With increasing advances in computer technology, computer- assisted instruction (CAI) is now seen by many as a method of providing relevant instruction to a large number of students. Researcher felt it necessary to consider important to know about the programme instruction before starting with the theoretical foundation of CAI. 64

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