NETAJI SUBHAS OPEN UNIVERSITY

B. Ed. Spl. Ed. (M.R./H.I./V.I.)-ODL

TECHNOLOGY AND DISABILITY

C-15 (M.R)

B. Ed. Spl. Ed. (M. R. / H. I. / V. I)-
ODL Programme

AREA - C

C - 15 (MR) : TECHNOLOGY AND DISABILITY (M.R.)

A COLLABORATIVE PROGRAMME OF
NETAJI SUBHAS OPEN UNIVERSITY
AND
REHABILITATION COUNCIL OF INDIA

AREA - C
DISABILITY SPECIALIZATION
COURSE CODE - C-15 (MR)
TECHNOLOGY AND DISABILITY (M.R.)

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The Self Instructional Material (SIM) is prepared keeping conformity with the B.Ed.Spl. Edn.(MR/HI/VI) Programme as prepared and circulated by the Rehabilitation Council of India, New Delhi and adopted by NSOU on and from the 2015-2017 academic session.

Mohan Kumar Chattopadhyay
Registrar

Netaji Subhas Open University

From the Vice-Chancellor's Desk

Dear Students, from this Academic Session (2015-17) the Curriculum and Course Structure of B. Ed.- Special Education have been thoroughly revised as per the stipulations which featured in the Memorandum of Understanding (MoU) between the Rehabilitation Council of India (RCI) and the National Council for Teacher Education (NCTE). The newly designed course structure and syllabus is comprehensive and futuristic has, therefore, been contextualized and adopted by NSOU from the present academic session, following the directives of the aforesaid national statutory authorities.

Consequent upon the introduction of new syllabus the revision of Self Instructional Material (SIM) becomes imperative. The new syllabus was circulated by RCI for introduction in the month of June, 2015 while the new session begins in the month of July. So the difficulties of preparing the SIMs within such a short time can easily be understood. However, the School of Education of NSOU took up the challenge and put the best minds together in preparing SIM without compromising the standard and quality of such an academic package. It required many rigorous steps before printing and circulation of the entire academic package to our dear learners. Every intervening step was meticulously and methodically followed for ensuring quality in such a time bound manner.

The SIMs are prepared by eminent subject experts and edited by the senior members of the faculty specializing in the discipline concerned. Printing of the SIMs has been done with utmost care and attention. Students are the primary beneficiaries of these materials so developed. Therefore, you must go through the contents seriously and take your queries, if any, to the Counselors during Personal Contact Programs (PCPs) for clarifications. In comparison to F2F mode, the onus is on the learners in the ODL mode. So please change your mind accordingly and shrug off your old mindset of teacher dependence and spoon feeding habits immediately.

I would further urge you to go for other Open Educational Resources (OERs) - available on websites, for better understanding and gaining comprehensive mastery over the subject. From this year NSOU is also providing ICT enabled support services to the students enrolled under this University. So, in addition to the printed SIMs, the e-contents are also provided to the students to facilitate the usage and ensure more flexibility at the user end. The other ICT based support systems will be there for the benefit of the learners.

So please make the most of it and do your best in the examinations. However, any suggestion or constructive criticism regarding the SIMs and its improvement is welcome. 1 must acknowledge the contribution of all the content writers, editors and background minds at the SoE, NSOU for their respective efforts, expertise and hard work in producing the SIMs within a very short time.

Professor (Dr.) Subha Sankar Sarkar
Vice-Chancellor, NSOU

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C - 15 (MR) ❐ TECHNOLOGY AND DISABILITY

Unit - 1 ❐ Technology in Education and Instruction

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- **1.6.1 Differential Instruction**
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- **1.6.3 Individualized Instruction.**

1.1 Introduction

There was a time when students used to be clustered at the feet of their gurus to listen and memorize what was read to them from a precious, laboriously produced hand written manuscript. Then gradually came the printed book which was a form of automation, a kind of teaching machine and students got their own copy to study on their own. So the function of the teacher has been changed. The teacher got relief from the tedious duty of reading information and got time to counsel and provide individualized teaching to students. The teacher got time to improve teaching by Explanation, interpretation and correlate the mass of information and knowledge available in text book to make the learning easier and joyful for the learners.

But as the world is progressing very rapidly due to new innovations in the field of science and technology which can be seen everywhere in our daily lives, we need to prepare our children for this new world by changing the way we educate them.

The 21st century is dealing with two basic problems namely population explosion and information explosion. The educational institutions has been affected with the increased number of students due to population explosion, increased mobility of students, increased range of students abilities and diverse backgrounds. The world has become a global village and due to technological advancement information flows rapidly among learners.

The Administrators and Teachers are actively searching for ways to prepare students for the future, and the educational system has been evolving faster than ever before.

A classroom is no longer consisting of four walls with a blackboard and a lecturer in front, talking to students instead of interacting with them. Interactive whiteboards, tablet PCs, projectors, mobiles and a host of other tools allow teachers to present information

in ways that prompt discussion and collaboration and make learning interactive and accessible.

Educationists believe that if technology is properly supported and widely used in teaching and learning process could help the most of the pressing needs and many teaching problems can be solved by the proper use of rich experience that can be gained through various media. In this technological era therefore, a modern and updated teacher must take full advantage of the existing technological resources to help facilitate students learning.

In this first unit of, we will make an attempt at understanding the concept and nature of educational technology. This unit will also help us to understand hardware, software, and systems approaches to educational technology. The scope of educational technology, recent trends and significance of ET.

We will also know about another important learning point, the concept of universal design of learning and individualized instruction which can help teachers to teach children with learning problems or who are differently able to access education with the help of educational and instructional technology.

1.2 Objectives

After going through this unit, the learner will be able to

- Understand the concept of educational technology;
- Understand the scope and importance of educational technology in the teaching-learning process;
- Understand the role of technology in education and acquire knowledge about its various approaches and modes.
- differentiate hardware, software, and systems approach to educational technology;
- classify different types of educational technologies and recent trends
- understand the concept and importance of universal design of learning and individualised instruction

1.3 Educational and Instructional Technology - Meaning, Nature, Scope, Definition, Objectives and Significance

1.3.1 Meaning and Definition of Educational Technology -

Before understanding the meaning of educational technology we should first of all know

the meaning of technology. In general we say the application of scientific laws and principles for the purpose of making daily life easy and comfortable is technology. With the help of these applications we make different machines and devices which accelerate and systematize our daily life. Therefore technology refers to two aspects namely - theoretical, based on ideas and practical based on putting those ideas into practice.

When we use technology for the purpose of accelerating and facilitating educational process and to make the education accessible to all kind of learners, that technology is called as educational technology. But this is not the complete meaning of educational technology. For many of us the term 'educational technology' is associated only with the equipment and with the hardware, which is used, viz. over head projector (OHP), LCD projector, television, computer etc. However, the concept of educational technology should not be confused or limited with the electronic gadgetry; it has a broader meaning. In its wider perspectives ET includes the entire process of the setting of educational goals, the continuous reforms of curriculum, the tryout of new teaching methods and materials , the evaluation of the education system as an integrated whole and if necessary, resetting of goals on the basis of the findings of evaluation and innovations.

Educational technology implies the use of all type of educational resources - men, materials, machine, methods and techniques, means and media in an integrated and systematic manner for optimizing teaching learning process in its best possible manner.

Educationists have understood educational technology in different ways, some of these dimensions are:

J.K Gailberth in his book The New Industrial State has given two main characteristics of every technology: 1. Systematic application of scientific knowledge to the practical tasks and 2.The division of the practical task into sections and sub sections. These two techniques are followed in educational technology too. For example by using educational technology the teacher first determines the teaching objectives then creates environment, all inputs(hardware and software) , selects and applies appropriate teaching strategies for achieving teaching objectives. At the end the teacher will evaluate the students to understand whether the teaching objectives have been achieved or not. If the outputs of the students are not satisfactory then changes will be made in the strategies so that teaching objectives can be achieved. This whole process completes into four stages:

1. Analysis of teaching tasks including inputs, process and outputs.
2. Observation or combined search and analysis for some specific components which has been used during teaching learning process.

3. Drawing conclusions about what strategy or behaviour has been successful.

4. Translating the experience into usable language for the benefit of other teachers.

Second meaning is Mechanization of educational process of human knowledge for the benefit of big masses through three phases

(A) Preservation of knowledge like printed books, tape recorder, CDs and digitals.

(B) Transmission of knowledge - sharing knowledge with the help of media.

(C) Advancement of knowledge - through machine knowledge reaches to mass and when they face any problem and they try to find out the solution with the help of technology and intelligence then knowledge advances automatically.

Third meaning is ET unites the science of learning with Art of teaching.

Definitions of educational technology: There are number of definitions of educational technology which have been provided by educationists, Researchers and scholars over the years. Some of the representative definitions are given below to get a better understanding of the term "educational technology".

G.O.M. Leith: "Educational Technology is the systematic application of scientific knowledge about teaching-learning and conditions of learning to improve the efficiency of teaching and training (Leith, 1967)."

S.S. Kulkarni: "Educational Technology can be defined as the application of the laws as well as recent discoveries of science and technology to the process of education(Kulkarni, 1969)."

D. Unwin: "Educational Technology in concerned with the application of modern skill and techniques to requirements of educational training. This includes facilitation of learning by manipulation of media and methods, and the control of environment is so far as this reflects on learning (Unwin, 1969)."

W. Kenneth Richmond: "Educational Technology is concerned with providing appropriately designed learning situations which, holding the view of objectives of teaching or training, bring to bear the best means of instruction (Richmond, 1979)."

J.R. Gases: "Educational Technology has to be seen as a part of persistence and complex endeavor of bringing pupils, teachers and technical means together is an effective way (Ford Foundation Team, 1971)."

US President Commission of Enquiry: "Educational Technology may be defined as a systematic way of designing, carrying out and evaluating a total process of teaching and learning in terms of specific objectives based on findings from research in human learning and communication (cited in, tucker, 1979:159). "

Educational technology offers the means to reach large numbers in remote and inaccessible areas, remove disparity in educational facilities available to the disadvantaged, and provide individualized instruction to learners conveniently suited to their needs and pace of learning (NPE, 1986).

- Educational technology is a communication process resulting from the application of scientific methods to the behavioural science of teaching and learning. This communication may or may not require the use of media such as television broadcasts, radio, cassettes etc. (UNESCO, 2001).

Based on the above discussion we may conclude that Educational technology is concerned with the systematic application of science and technology in the field of education. It is helpful for both, the teacher and learner to set the learning objectives, strategies, procedures, materials and establish a good communication between them and make the teaching learning process more effective.

1.3.2 Nature of Educational Technology

- ET is the applications of scientific principles to education.
- ET is the development of methods and techniques for effective teaching-learning.
- ET is not confined to the use of electronic media in Education. It includes systems approach also.
- ET involves total teaching and learning process:input, output and process aspects of education.
- ETprovides technical guidance and solution to the educational problems.
- It helps in effective communication between teacher and students.
- ET speed up the process of learning.
- ET is very effective in large classroom management by using projector, microphone, speaker etc.
- ET can train large masses with the help of media.

- New concepts are coming out with help of edu tech like e-learning, online learning, mobile learning etc.

So we can say educational technology has the potential to bring about improvement in education both qualitatively and quantitatively.

1.3.3 Objectives of Educational Technology

- **General Objectives**

The objectives of Educational Technology at macro level or broad level are as under:

1. Identifying educational needs of the community.
2. Determining the aims of education.
3. Developing a suitable curriculum.
4. Developing certain models to improve the process of teaching and learning.
5. Identifying the human and non-human resources.
6. Developing the appropriate aids and equipment to meet the educational needs.
7. Identifying the major obstacles in the educational environment and the ways and means to tackle those.
7. Suggesting remedies to overcome the above traced out obstacles.
8. Managing the whole system of education including planning, implementation and the evaluation phases.

- **Specific Objectives**

The objectives of educational technology at micro-level i.e., in view of specific class-room teaching are as under:

1. Identifying the educational needs and analyzing the characteristics of the pupils.
2. Determining the class-room objectives in behavioural terms.
3. Analysing the contents of instructions and organise them sequentially.
4. Identifying the available and necessary teaching-learning materials and resources.
5. Planning the suitable teaching strategies
6. Utilizing the man-material resources for achieving specific classroom objectives.

7. Evaluating class-room teaching in terms of students' performance.
8. Providing feedback to the teacher and the students for betterment of teaching-learning process.

Regarding objectives of Educational Technology, Hilliard Joson has given the following objectives :

1. Transmission of Information.
2. Serving as role model.
3. Assisting the practice of specific skills.
4. Contribution to the provision of feedback.

- **Main Objectives of Educational Technology**

1. To help to improve the environment required for the teaching learning process.
2. To make the class-room teaching-learning more effective.
3. To modify the behaviour of the teacher and the learner.
4. To improve and update the methods of teaching and learning.

1.3.4 Origin and history of educational technology:

To describe the emergence of educational technology we need to discuss it from two aspects.

The first aspect is the global and general worldwide historical development, while the second aspect relates to the historical development at the local level or Indian history.

Global Historical Development of Educational Technology

Stone Age Period: We have studied in our school that during Stone Age people used to live in cave and they used to draw on the cave wall, tree trunk, slabs, and rocks to share their experience. There was no teaching concept or standardized writing language for communication. People used to experience and learn from the environment.Those drawings are associated with the invention of writing technology.At about3100 B.C Egyptians devised a system of picture writing called hieroglyphics. Gradually standardized writing system evolved in many countries.

With the progress of civilization education system emerged. Socrates used to teach his pupil with oral dialogue system and pupil used to memorize it. Hand written books were in uses for teaching.

The Age of Book and Chalkboard

In 1456, Johann Guttenberg developed the printing machine and printed the first Bible. With this invention, the art of printing spread widely and other bookswere produced. The one each to one teaching or verbal method of teaching changed and knowledge spread among pupil in the form of books. School system started and teacher started teaching with the help of blackboard and chalk.

Mass Communication Age

The invention of the radio and the television made a significant landmark in the development ofEducational technology worldwide. Knowledge spread all over the world without any boundary and to the mass. Mass education and education to less privileged society was easy with the help of this technology. Though, the radio served this purpose better than the television as it was low cost.

The Information Communication Age/Computer Age

The invention of the computer has remarkably changed the educational practice the world over.With computer technology comes the information age. The first computer was invented by IBM. With the advent of the computer technology the followingdevelopments started (Conway, 1990):

(i) Electronic board akin to the white boards with special pens capable to transferring datawritten on it to the system;

(ii) Multimedia system equipped with a sound blaster and speakers;

(iii) CD-ROM player / DVD-ROM player (on which audio, images and video files arerecorded);

(iv) Video disk player and a videotape player controlled by the personal computer PC);

(v) PC - PC conferencing mode;

(vi) The touch screen and voice recognition/communication devices for the special educationstudents;

(vii) The digital camera that combines very well with computer where images can be shownand be manipulated / printed;

(viii) Advances in virtual reality - virtual libraries, virtual universities, etc.

Computers are now using packaged instructionslike CAI, CBI, and CALeither in a mediated form or in non-mediatedform using any or a combination of the styles of drill and practice, tutorials, games, simulations,and/or interactive knowledge-based system.

So nowadays education does not depend on face to face interaction between teacher and learner and a closed set up rather than education is now anytime anywhere matter with the help of technological devices and programmed learning. Online learning with the help of internet facility has opened limitless quantity of doors of possibilities for contemporary learner to make their life happier than ever before.

Use of educational technology in India:

Indian education started with Gurukul system where pupil used to listen to their gurus and learn. Then gradually came the age of books and some other teaching material like, blackboard chalk, teaching aids etc. Before 1960 the term educational technology was not popular to Indian education system.

But now educational technology is being used in all sector of education and both in formal and non formal education system. The use of technology properly started and became popular after the invention of radio.

In 1929 Bombay aired some educational programmes for school children for the first time. As the radio network cover most of the part of the country so it was easy to reach many people at a time. Thus various education programme was started to develop to educate the mass. Radio was used to teach people about agriculture, weather, basic literacy and educational programmes for both in school and out school groups.

The school TV project was first introduced in Delhi in 1961 and it is widely used in education sector.

In the year 1972-1973 govt. of India launched first education technology project. With the advent of satellite services and with the launching of EDUSAT project, television started to be used more and more for the national development and reached to the masses living in remote or rural areas.

The central institute of technology NCERT established in 1984. The CIET started working to develop software materials to meet the educational needs and also conducted research, trained human resource to use educational technology in education sector.

In 1975, the satellite television experiment (SITE) was launched. INSAT was used by UGC. National open school and IGNOU established in 1979 and 1985. Distance mode education, NOS started to use technology with combination of media and it was helpful for those who could not complete formal education.

For teaching foreign languages like, German, Spanish, French etc also technology is used.

Nowadays we are using computers, advanced form of ICT and internet in association with various technological aids in education sector. Country like India where population is very high and scope of higher education is limited in rural and remote areas technology is kind of boon which can help to learn at own place.

To sum up, educational technology in India is being used as under:

- School broadcast
- TV Telecast lessons
- Teacher preparation
- Distance education
- Correspondence courses
- Development of audio- visual materials
- Language teaching
- Production of multipurpose kits or instructional aids
- Computer literacy and studies in schools.

1.3.5 The Scope of Educational Technology

(By Lucido, 1997)Educational technology is the development, application, and evaluation of systems, technique, and aids to improve the process of human learning.

(Association for Educational Communication and Technology) ET is the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning.

(Hoffman, 1994-2009, as cited by www.books.google.com) ET is a systematic, iterative process for designing instruction or training used to improve performance.

As Educational technology aims to improve the quality of human learning process so the scope is unlimited as it tries to reach out to more and more people involved in the teaching-learning process. The scope of educational technology can be described under the following points:

1. Spelling out Educational goals and Objectives.

- Help for the formulation of objectives and goals of education based on individualized and social needs.

2. Curriculum Development.

- Planning of curricular and co-curricular inputs in order to realize planned goals and objectives.

3. Developing Teaching-Learning materials and Resources.

- Develops necessary learning materials in the form of programmed learning books, computer learning packages, mass media instruction, individualized self-instructional packages etc.

4. Developing Human resources.

- ET covers the area of teacher education.

5. Developing Strategies.

- Teaching strategies, approaches and methods are devised and developed catering to different types of students.

6. Developing Multi-Sensory Aids.

- Design, development of audio visual aids.

7. Develops Feedback Mechanism.

- ET develops tool of evaluation to provide feedback.

8. Develops Passive Instruction Services.

- Educational radio, TV, computers are used for transmitting information. They are passive services since all decisions are in the hands of the providers, i.e., what to be presented, for how long, in what sequence and when.

9. Develops Interactive Instruction Services.

- ET tries to provide opportunities for the learner to control the pace, mode of presentation etc. e.g. Computer Assisted Instruction (CAI), Teleconferencing via Internet etc.

10. Develops Learning Environments.

- ET develops learning environment that are learner friendly. Eg. Simulation

11. Developing Information Resources.

- ET bridging the gap between developments in Information Technology and Education. Information Resources:Eg. E-libraries, On line encyclopaedia,World Wide Web,

12. Develops Communication Devices.

- ET has developed communication devices for students who have problem in communication.

Thus we can say Educational technology aims at increasing efficiency, effectiveness of teaching learning process and simultaneously aims at bringing pedagogical changes for betterment of education. It works for over all planning and organization of the system or subsystem of education.

1.4 Educational Technology and Instructional Technology: Role and Recent Trends

The two concepts Educational Technology and Instructional Technology are used interchangeably. Instructional Technology is a subset of educational technology, based on the concept that instruction is a subset of education. Educational Technology is wider concept than Instructional Technology as education is wider than instruction. Instructional Technology is the theory and application of proper tools and techniques in instructional settings, while educational technology is concerned with whole education process and contexts. All parameters of instructional technology are suited within that of educational technology, while all of educational technology does not suit within the parameters of instructional technology.

Instruction Instructional Technology is not merely a knowledge area that deals only with audiovisual instructional materials. It is a way to think about problems of teaching and learning to find workable solutions (Wittich&Schuller, 1973).

1.4.1 Definition and Meaning of Instructional Technology

As defined by Momurin (1970), Instructional technology is a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction.
Sharma (1989) defined instructional technology as a network of techniques or devices employed to accomplish certain defined set of learning objectives.
Instructional technology applies the principles and theories of psychological learning to get deep insight into the content, structure and sequence of instruction to develop instructional resources for attaining desired learning outcomes. In other words, instructional technology works at shaping the instructional uses of the materials to turn them into instructional resources.
In brief we can say the term "Instruction" refers to systematically organized programme designed to produce certain knowledge, skill, understanding, attitude, and behaviour patterns among learners.

The term "Technology" refers to systematic application of scientific or other organized knowledge to practical tasks.

So a technology of Instruction is a particular systematic arrangement of teaching learning events designed to put the knowledge into practice in a predictable effective manner so as to attain specific objectives.

Further, Instructional technology determines and provides appropriate stimuli to the learner to produce appropriate responses for making learning more effective. The definition of Instructional Technology prepared by the Association for Educational Communications and Technology (2000) is as follows, Instructional Technology is the Theory and Practice of Design, Development, Utilization, Management, and Evaluation of processes and resources for learning.

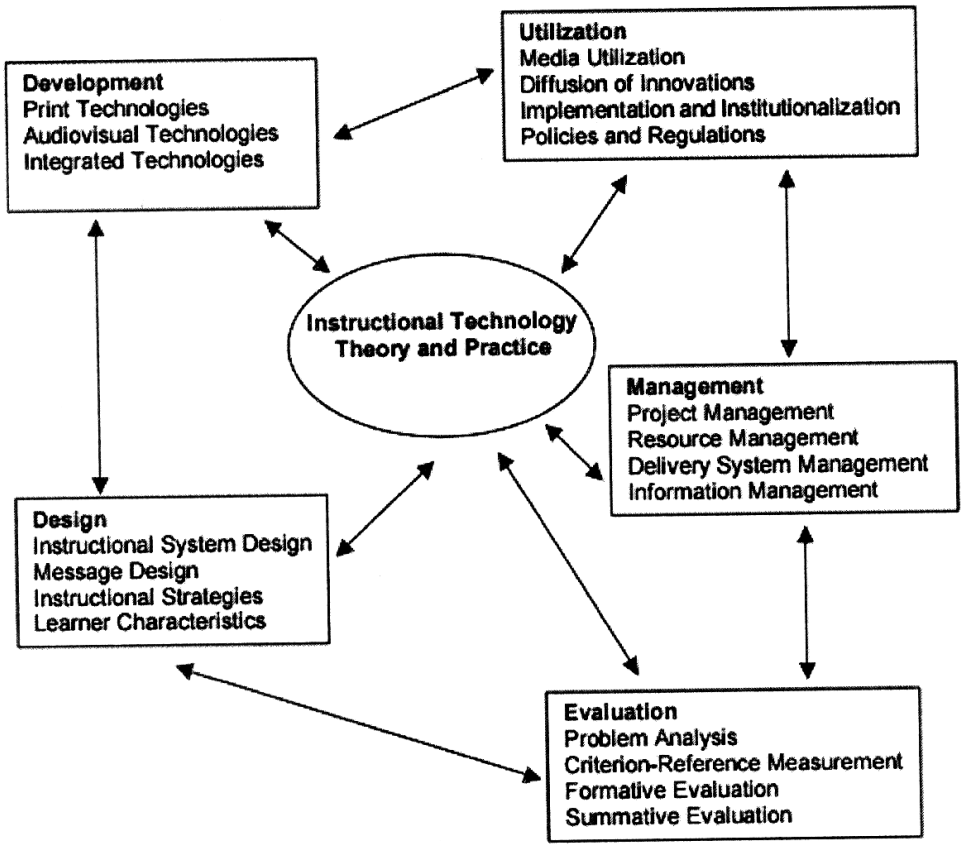


FIGURE 1.1. Instructional Technology: Its domains and sub domains.

(Adapted from, 'NCATE Program Standards. Initial and Advanced Programs for Educational Communications and Technology'. Prepared by Association for Educational Communication and Technology Bloomington, IN, 2000, p.12.)

From the above it is understood, theory consists of concepts, constructs, principles, and propositions that serve as the body of knowledge; Practice is the application of that knowledge to solve problems; Design refers to the process of specifying conditions for learning; Development refers to the process of translating the design specifications into physical form; Utilization refers to the use of processes and resources for learning; Management refers to processes for controlling Instructional Technology, and Evaluation is the process for determining the adequacy of instruction. (Seels& Richey, 1994).

Through Instructional Technology teachers share content or information to the learners. Contents can be presented on three levels, memory, understanding and reflective levels.

However instructional Technology present the content to the second level of teaching only and for reflective level of teaching,help of teaching technology is necessary.

In a similar way communication also has two elements verbal and nonverbal. When teacher asks question and students give answer then it is called as verbal communication. Butwhen teacher uses his body actions or gestures or material for communicating the content then it is called as nonverbal instruction. For example if a teacher wants to show the meaning of clap to the class he does the activity and say it is clap.

Instruction can be provided by the teacher or by the machine like in online learning or self instructional material, and it does not make any difference.

For example Open Universities gives teaching instructions by using TV, radio or Internet to thousands of students in a single sitting and who's over is interested can take the benefit of this program.

So instructional technology is based on hardware approach as all the communicationwith the learners are being done by using audio video recorder, radio or television or computers. There is no direct interaction between teacher and students as we see in teaching or behaviour Technologies. Here teacher plays the role of an instructor and he/ she does not invite the students to participate in the lesson. With effective communication skill teachers makes the instruction proves interesting and intellectually stimulating.

In instructional technology, instructional materials are prepared based on the objectives formulated in advance, and thencontent is presented by using different strategies, techniques and material. At the end the outcomes of the learners are evaluated in order to ascertain whether instructional process is successful or not. A teacher needs knowledge of psychological and scientific principles and laws and awareness of social values and norms, teaching maxims and principles of teaching while preparing instructional materials.

1.4.2 Characteristics of Instructional Technology:

1. Objectives of cognitive domain can be achieved.
2. This technology is helpful to fill up the deficiency of effective teachers because we can communicate the instructional material to thousands of learners at a time by recording the lecture of an effective teacher into machines.
3. By the use of this technology students can learn according to their own ability and needs and pace. Can practice same content repeatedly as long as he wants without the help of teacher.
4. With trial and error process students learn independently.Students can be reinforced regularly which will lead to for the right responses to occur.
5. Analysis of the subject matter is also possible with the help of this technology and it can make the presentation easy and logical.
6. Developing instructional technologies based on psychological learning theories and principles.

To develop a successful instructional plan/strategy for a specific content following steps should be kept in mind:

1. Setting of instructional objectives

To develop a successful instructional plan first we needs to plan and setinstructional objectives. After learning the content or matter what type of behavioural changes are expected from the learner that needs to be decided and written in behavioural termsby taking the help of Robert eggers approach Robert Miller approach or RCEM approach before proceeding further in the task of imparting instruction. Instructionalobjectives must be based on the following:

- Grade level of the learner
- the physical emotional social and mental potential of the learner
- the previous experiences of the learner related to the subject and topic
- the main material resources available for imparting instruction

Taking decisions about the instructional material

Based on the instructional objectives learning experience and teaching materials need to be decided and organized for delivering the instructions successfully. Instructional material will be selected and used based on the following the principles of simple to Complex specific to general theory to practice etc. There are different types of teaching learning material available from visual to audio-visual aids and many technologically advanced products like computer, projector, audio books etc, so the teacher must select appropriate TLM based on the content and instructional strategy.

Taking Decision about the media and methods:

To carry out the teaching learning process effectively, appropriate decision must be made for selecting media and method for delivering instructions. Various types of instructional strategies are available, so teacher must have enough knowledge to select and use the strategy properly according to the syllabus and topics. Some of the important instructional strategies like lecture strategy, demonstration strategy tutorial strategy innovation strategy description strategy, role playing, gaming, group discussion, question answer, discovery, problem solving Strategies and strategy assignment etc. can be used for teaching and learning.

Special instructions are needed for carrying out auto instruction of self learning like program instruction carrying out with the help of teaching machines, computer assisted instruction, personalized system of instruction CSI learner construction LCI, etc.

Taking decision about the proper instructional environment:

A suitable instructional environment must be chosen by the teacher based on the topic for carrying out the particular type of instruction.

Helping in the task of evaluation :

Evaluation is a very important part in any type of instructional activity carried out by the teacher or learner in the shape of auto instruction to understand that the instructional objectives have been achieved or not. Some evaluation strategies are , teacher made test, standardized test, construction of the achievement test, evaluating the cognitive affective and psychomotor changes in people's behaviour through suitable test and techniques, self evaluation test Strategies and techniques.

So in this way instructional technology can help the teacher as well as the learners in the attainment of the stipulated instructional objectives.

1.4.3 Advantages and Needs of Instructional Technology

- **Advantages of Instructional Technology**
- Advantages of Instructional Technology
- Makes the instruction more interesting.
- Delivery of instruction is more standardized.
- Learning becomes more interactive by applying accepted learning techniques.
- Quantity of learning is improved.
- Instruction can be provided as and when required.
- Help in development of positive attitude of students towards learning and to the learning process itself.
- The role of instruction can be appreciably changed in positive direction.

■ **Needs of Instructional Technology**

The purpose of instructional technology is to make education more productive, individualistic, powerful and scientific which enhances the learning more immediate with more equal access.

The use of instructional Technology can solve educational problems related to are given below as

- Growing population
- Heterogeneity of learners
- Divergent and even conflicting needs of the learners coming from different socio-cultural areas
- Rapid development of new information
- Knowledge explosion
- Development of communication devices
- Extending curricular and social changes arising from modernization

1.4.4 Role of Educational Technology in the Teaching-Learning Process

1. Educational Technology has bought revolution in the entire education system. Previously, the teachers used to be the sole interpreter of knowledge to the learners and the textbooks was the sole resource. But now this conventional role has been changed and it has opened up the new areas of teacher functions such as management of resources and management of learning. Today, teachers have a range of media to assist and supplement the instructional work. With the help of technology teachers can even specify the learning intentions, select the topic, identify the stimulus situation, determine media, manage teaching and finally conduct evaluation and modify the instructions in the light of evaluation results. So the teachers have the opportunity to design meaningful learning experiences that embed technology.
2. Learning with technology has become essential in today's schools. Worldwide, governments, education systems, researchers, school leaders, teachers and parents consider technology to be a critical part of a child's education.
3. Educational process can't proceed systematically without the help of educational technology. Every aspect of educational system is fully enlightened with educational technology.
4. Educational technology has provided a scientific base to the educational theory and practice. It has transformed a passive classroom to an active and interactive classroom, with audio-visuals, charts and models, smart classrooms and e-learning

room which has drastically motivated and increased the attention level of the students.

5. The teaching-learning climate of the educational institutions has been modernized.. The learners are being exposed to professionally designed programmes on video or computers under programme learning concept.
6. Educational technology helps the learners to learn at their own pace with repeated practice so teachers are relieved of the burden of routine repetition for exercise and revision purposes. Ithas helped and supplemented the teachers in their instructional programmes also through the structured lessons for remedial, enrichment or drill purposes.
7. Educational technology has provided well-integrated structured materials for teachers thus saving a lot of their time which in turn may be utilized for creative work and quality improvement.
8. Educational technology helps the teacher to use scientific methods for solving educational and administrative problems. It adds to the teaching competence of teachers and inculcates a scientific outlook and scientific temper in teachers and students.
9. Educational technology has made the teaching-learning process more effective and process oriented. Television, Radio, V.C.R, Computers and LCD projectors etc. have enriched and facilitated effective transmission of knowledge.
10. Educational technology has improved the process of teaching by giving it Teaching Aids and Programmed Instructional Material.
11. Feedback devices have modified teaching-learning behaviour so produced effective teachers in the teacher-training institutes.
12. Educational programmes on T.V, Radio and Internet are beneficial for Students who appear for higher or competitive examinations.
13. Examination process, evaluation, classroom-teaching and various other sectors of education are being modified with the help of ET and new researches are going on to make it more effective for learning.
14. Educational technology can help teachers to teach according to individual differences of learners and based on the learners need assistive technology can be introduced for smooth learning.
15. It helps in constant social interaction; digital content can be easily created and shared among large population.
16. Technology helps to find information by accessing the internet through cell phones and computers or chatting with friends on social networking sites.

17. Educational technology has provided scientific foundation to education through the theories of learning and intelligence and it allows for 24/7 access to information.
18. Thus educational technology is required in each and every aspect of teaching learning process and serves all the purposes for modern education. According to Davis and Hartley.
19. "Educational Technology in its wide sense as understood today, includes the development, application and evaluation of systems and techniques involving men, machines, media and instructional material as components, so as improve the process of human learning and attain the educational goals. -"

1.4.5 Recent Trends of Educational Technology and Instructional Technology

Let us look at a table to understand the recent trends in technological development in education sector:

Table 2.1: ***Technologies for teaching (1500 BC – 1990 AD)***

Development	Year in general use
Teachers	1500 BC (at least)
Printed book	1450
Postal service	1850
Blackboards (Chalk)	1850
Telephone	1890
Radio	1920
Film	1920
Broadcast television	1950
Cable TV	1950
Audio-cassettes	1965
Computer-based instruction	1970
Satellite TV	1975
Laser video discs	1975
Audio-conferencing	1975
Personal computers	1980
Audio-graphics	1980
Viewdata/Teletext	1980
Computer conferencing (CMC)	1980
Compact discs (CDs)	1985
E-mail	1985
Video-conferencing	1990
Projectors	1990
Smart Board	1990

Table 2.2: ***Technologies for teaching (1990 onwards)***

Development	Year in general use
Internet	1990
World Wide Web	1990
Simulations and games	1990
Learning management systems	1995
Browsers/web portals	1995
Wireless networks	1995
Mobile phones	1995
Learning objects/OERs	1995
Fibre optic cables	2000
DVDs	2000
Search engines	2000
Social software	2002
Virtual reality	2003
e-Portfolios	2005
Clickers	2005
You Tube	2005
Lecture capture	2008
e-books	2009
Cloud computing	2010
Learning analytics	2011

Source: IGNOU E-gyankosh, Santosh Panda

From the above tables it is very clear that technology has a great impact on the entire education system. From face to face interaction or lecture method to online learning, things has been changed a lot. Now classrooms are well equipped with different types of technological devices from smart board to laptops, speaker, microphone, head phone, projectors, smart phones, e books, audio books, internet, Wikipedia, you tube, blogs, podcasts, moodle, CAI, and many more things to improve and personalize the learning experience.

1.5 Major approaches of Educational Technology

Lumsdaine(1964) has suggested following approaches of Educational technology:–

A. Hardware approach or first Educational technology

B. Software approach or second Educational technology

C. Systems approach or third Educational technology

D. Individual and Mass Media Approach.

1.5.1 . Hardware Approach (Technology in Education)

This approach implies the use of mechanical materials and equipments in education. The term was first introduced by James O. Finn & Others.This approach originated from Physical Science and engineering and is based on the concept of service, i.e., using technology in education (Silverman 1968). This approach is a by-product of the scientific and technological developments of the 20th century. In this approach the main feature is the use of audiovisual aids like charts, models, film-strips, slides, audio cassettes, and sophisticated equipments like film projectors, OHP, slide projector, radio, tape recorder, LCD projector, DLP Projector, CD players, DVD Players, TV, computer etc in teaching learning process.

Hardware approach mechanizes the process of teaching so that teachers would be able to deal with more students with less expenditure, less time and effort in educating them.

Human knowledge has three aspects

- Preservation,
- Transmission and
- Development.

With the invention of printing machines the preservation of knowledge started. The knowledge is preserved with these machines in the form of books and kept in the libraries,

taperecorders and films.

The second aspect of human knowledge is its transmission. A teachercan impart knowledge himself to his pupils. Now days, transmission of the knowledge is supported by machine like mike, radio and television. With these, thousands of pupils can be benefitted at a time.

The third aspect of human knowledge is its development. Teachers can study through online libraries and enrich themselves other than that they can do research work to develop new knowledge.For this purpose, presently the researcher uses the electronic machines and computers to collect and analysis of data. 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 and also called as technology of education.

1.5.2 Software Approach (Technology of Education)

This approach implies the use of Psychological principles and learning theories in education. The term was first introduced by Skinner & Gagne and it originated from Behavioral Science.

Software Approach is also termed as Instructional Technology or Teaching Technology or Behavioural Technology.

This approach of educational technology involves a systematic, scientific application of appropriate scientific research, both from the physical science, social sciences and particularly from psychology and sociology, in order to solve a problem. Here, it is important to understand that technology of education emphasizes on the techniques of teaching and learning derived from the principles, ideas, and practices drawn from various fields of knowledge such as; psychology, sociology, philosophy, management, cybernetics, etc. in order to optimize the teaching-learning process. Instead of using machines this approach uses the principles of teaching-learning for bringing desirable changes in the behaviors of the pupils. In software approach machines are only used for clarification of concept and principles. So this technology is related with the mental aspect of the task and it writes the educational objectives in the behavioural terms, selects suitable presentation strategies of the subject matter, uses reinforcement devices and evaluates the outcome of the learners. According to Silcherman (1968) it is also called as constructive educational technology. It consists of 6 steps:

1. Analysis of instructional problems.
2. Writing objectives in behavioural terms
3. Selecting suitable teaching strategies
4. Reinforcing the students on right responses

5. Selecting or constructing measuring instruments for evaluating instructional outcomes.
6. Decision making and improvement.

From the above discussion it is very clear that both software and hardware approaches are so interlinked that they cannot be separated from each other. One without the other is incomplete. It is software approach which makes the hardware approach function well.

Distinction between hardware and software technologies

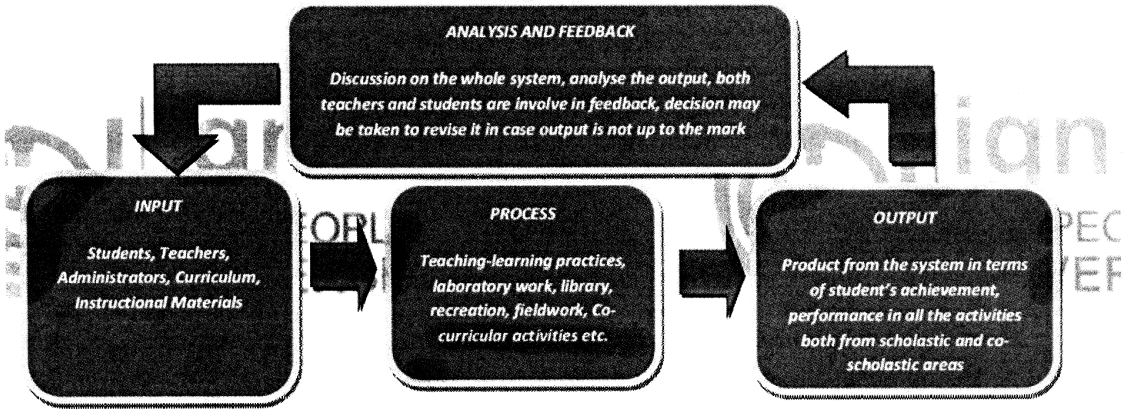
Technology in education Hardware approach	**Technology of education Software approach**
In is based on the principles of physical sciences or engineering sciences.	It is based on child psychology (age, ability and mental level).
Its approach is identified as hardware approach.	Its approach is identified as software approach.
Its origin lies in the application of physical sciences or engineering to education.	Its origin lies in the application of behavioural sciences to the problems.
TV, Radio, Slide Projector, Computer, OHP etc.	Text books, work books, newspaper etc.
It is related to teaching aids	It is related to learning aids.
Skilled personnel in hardware technology are needed.	The use of this approach does not require skilled personnel as in hardware technology.
This approach is relatively rigid	This approach is very flexible
It is called relative technology	It is called constructive educational technology
It is useful in mass education programmes.	This approach is very helpful in understanding the need of the learners and educating them accordingly.
It is expensive.	It is less costly.

1.5.3 Systems Approach

System: A system is any collection of interrelated parts that together constitute a larger whole. Many number of units working together for a particular goal.These component parts, or elements of the system areintimately linked with one another, either directly or indirectly, and any change in one or more elements may affect the overall performance of the system, either beneficially or adversely. The Term was first introduced by Davis & Hartley.

Definition: System approach is an integrated, programmed complex of instructional media, hardware and personnel whose components are structured as a single unit with a schedule of timeand sequential phasing.

It is a modern approach in educational administration and organization.It acts as a link between hardware and software approach. It is also known as 'Management Technology'. It has brought to educational management a scientific approach for solving educational administrative problems. As we know that teaching learning is a complex process and it needs systematic planning to achieve pre determined objectives. To streamline the teaching-learning process we use the systems approach which is concerned with systematic planning, designing, construction and evaluation of the education system. Systems approach is applied to develop, implement and evaluate the whole educational system, sub-system, and curriculum or, for designing an individual lesson. There are four elements of the systems approach: input, process, output, and analysis & feedback. Let us understand, how these elements function together to make the education system more productive.



Parameters of system approach

So we see that the System Approach focuses first upon the learner and then course content, learning experiences and effective media and instructional strategies and then the performance level of the students. Based on the performance level feedback will be collected from all including teachers, students and administrators .So if there is any problem within the system then it will be identified and rectified and also the parameters of the system approach can be modified for improving the overall teaching learning system.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 softwareand evaluates various aspects of theeducation system, and sub-system. The main purpose of the systems analysis is to create a systematic, organized, effective and enabling learning environment for both teachers and students.

1.5.4 Individual and Mass Media Approach

Due to information explosion and population explosion we need to use mass media which is a boon of science and technology to convey loads of information to larger section of people within short time span. For example newspaper, TV, radio, internet etc. As number of students are increasing day by day and world has become a global village, now a days this mass media technology is utilized for educational purposes also. 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 organization on certain subjects and encouraging originality and creativeness. Therefore, teachers need to be properly motivated and interested for using such materials. Other than that training is also necessary for the teachers to use and maintain the materials.

For a learning society like India which has a huge population of one billion, the media systems based on modern technology constitute a very potent tool for education and development. It has varied and numerous applications bearing on almost all aspects of individual and social life. In one sense, all these uses of information technology basically have their impact in educating people, giving them knowledge, skills, improving understanding and changing their attitudes. The media is used for both formal and non-formal education systems and also for individual and mass levels of learning.

Technologyis used for Distance Learning Mode courses and appears to be an avenue of promise for every country in the world. InIndia, IGNOU and CIET (Central Institute of Educational Technology) are launching distanceeducation programmes throughout the country. In general, distance education employs avariety of delivery systems such as correspondence courses, radio, television, audio-visualmaterials, telephone lessons and teleconferencing. So it is seen that mass media approach is very effectiverole to play in adult education.

In the formal school situations also we can use media to make the teaching learning process more interactive or interesting.

The Delors Commission (P-173) also observed that the new technology has created a host of new tools for use in the classroomas under:

-- Computers and Internet,

- Cable and Satellite TV Education,

-- Multimedia equipments,

-- Inter-active information exchange system including e-mail and on-line access to librariesand public data base.

- Teachers can coach their students to use media effectively for the information (like helping students to find specific websites)and in this way, a new partnership can develop in the classroom.
- If technology and media is used with the conventional mode of education it can enrich the formal system by fillinginstructional gaps, updating knowledge, and giving new learning experiences.
- With the advent of computer and internet the information and knowledge is not limited within teacher and library only, the students can access to any information at home also and can learn on their own.
- The role of media and educational technology has been clearlydefined in NPE-86 as under:
- "Modern communication techniques have the potential to bypass several stages andsequences in the process of development encountered in earlier decades. Both the constraintsof time and distance become manageable. In order to avoid structural dualism, moderneducational technology must reach out to most distant areas and most deprived sections ofbeneficiaries."

Importance of Mass Media:

1. Mass Media provide information to the mass within a less time.
2. It takes a wide coverage of information regarding anything that is happening in any corner of the world.
3. It brings the entire world to the individual or to the classroom. Children spend hours together sitting in front of the television and can visualize, hear and acquire knowledge about the world so it is kind of multisensory learning also.
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.

So education today, 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. According to educationists and researchers use of mass media like educational TV, radio, press, newspaper, films, documentaries, internet, educational apps, mobile, etc has made the quality of education improved and also made the learners and teachers modern and up to date.

Individual approach: Using individual approach is a modern trend in education. If a student cannot understand a matter in classroom set up, they need individualized teaching and repeated practice but due to heavy workload teachers cannot help a student individually always. So with the help of technological equipment and media like 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, online library etc these problems can be solved. The use of computers and multimedia systems make it possible to design individual learningpaths along which each pupil can move at his/her own pace.The compact disc technology(CD) has a special role to play, for it can handle large amount of information complete withsound pictures and text. Interactive media allows pupils to ask questions and look upinformation themselves. It is observed that pupils who are under-achievers or experiencedifficulties in conventional mode of education reveal their talents better and show moremotivation and curiosity in informal mode.

But development of these technologies cannot replace the textbook and the teacher. Inchild's education they have their own role to play. Text books are the cheapest media and easiest to handle,illustrating the teacher's lessons, allowing the pupils to' revise lessons and to gainindependence. Similarly, the development of these technologies does not diminish the role of teachers, but It is also truethat in today's world teachers cannot be regarded as the only repository of knowledge thatthey have to pass on to the younger generation. Now the role of the teachers have been changed, now they are learning partner, guide, instructional designer and supervisor for self learning and how to seek, look up and appraise facts and information.

1.6 Differential Instruction, Universal Design of learning and Individualized Instruction

1.6.1 Differential Instruction

As we know that 'one size doesn't fit all' (Willis and Mann 2000) so the one single curriculum, one instructional or evaluation strategy may not be suitable for all type of learner. Every child is unique and special and differs from one to another in size, shape, and social development. Students also learn differently. Teachers can no longer teach "The Lesson" and hope that everyone gets it. Based on this knowledge, differentiated instruction applies an approach to teaching and learning that gives students multiple options for taking in information and making sense of ideas. Differentiated instruction is a teaching theory based on the premise that instructional approaches should vary and be adapted in relation to individual and diverse students in classrooms (Tomlinson, 2001). Differentiated instruction recognizes the fact that we have a diverse student population and teachers must understand students' background knowledge, readiness, learning styles, language and interests.According to right to education Act (RTE) - 2009, the present day classroom should be inclusive in nature and welcoming and is pedagogically capable of educating the naturallydiverse population of students who arrive at its door. Based on the Differentiated instruction principles teachers can create such classrooms.

Differentiated instruction is a technique that teachers use to accommodate each student's learning style and instructional preferences. This strategy may involve teaching the same material to all students using a variety of instructional methods, or it may require the teacher to teach content at varying levels of difficulty based on the readiness, interests and ability of each student. The foundation of Differentiated instruction is based on Piaget's constructivist theory, Vygotsky's socio-cultural theory; Gardner's multiple intelligence theory, varied learning style.

According to Piaget' teachers should facilitate the learning process by organizing learning activities and using variety of aid material according to the level of student's cognitive structure to enable him to construct knowledge through his experiences. According to Gardener teachers should provide educational opportunities in such a way that nurture the strong area of intelligences but also allow students to use all their intelligences.

Tomlinson (2005), a leading expert in this field, defines differentiated instruction as a philosophy of teaching that is based on the premise that students learn best when their teachers accommodate the differences in their readiness levels, interests and learning profiles. A chief objective of differentiated instruction is to take full advantage of every student's ability to learn (Tomlinson, 2001a, 2001c, 2004c, 2005). In addition, she points out that differentiating can be performed in a variety of ways, and if teachers are willing to use this philosophy in their classrooms, they opt for a more effective practice that responds to the needs of diverse learners (Tomlinson, 2000a, 2005). Tomlinson (2000) maintains that differentiation is not just an instructional strategy, nor is it a recipe for teaching, rather it is an innovative way of thinking about teaching and learning.

To differentiate instruction is to acknowledge various student backgrounds, readiness levels, languages, interests and learning profiles (Hall, 2002). Differentiated instruction sees the learning experience as social and collaborative, the responsibility of what happens in the classroom is first to the teacher, but also to the learner (Tomlinson, 2004c). Building on this definition, Mulroy and Eddinger (2003) add that differentiated instruction emerged within the context of increasingly diverse student populations. Within the learning environment permitted by the differentiated instruction model, teachers, support staff and professionals collaborate to create an optimal learning experience for students (Mulroy and Eddinger, 2003). Also in this environment, each student is valued for his or her unique strengths, while being offered opportunities to demonstrate skills through a variety of assessment techniques (Mulroy and Eddinger, 2003; Tomlinson, 2001a; Tomlinson and Kalbfleisch, 1998; Tuttle, 2000).

Differentiated instruction supports the classroom as a community, accommodating differences and sameness (Bosch, 2001; Brimijoin, Marquissee, and Tomlinson, 2003; Lawrence-Brown, 2004; Tomlinson, 2003). It allows for the creation of an environment in which all students can succeed and derive benefit (Lawrence-Brown, 2004; Tomlinson, 2003). Students differ in three important ways - readiness, interests and learning profiles - in a differentiated classroom, the teacher is obliged to attend to these differences in order to maximize the learning potential of each student in that classroom (Tomlinson, 2000b, 2001a).

Differentiated instruction requires teachers to transform their practices from a program-basedpedagogy to a student-based pedagogy. Teachers attempt to adapt pedagogical interventionsto the needs of each student, acknowledging that each student differs in interests, learningprofile, and level of functioning. Differentiated instruction may facilitate high levels of bothstudent engagement and curricular achievement (Caron, 2003; Tomlinson, 2004).

Curriculum tells teachers what to teach, while differentiated instruction tells teachers how toteach it to a range of learners by employing a variety of teaching approaches. Students candevelop their potential if they are provided with appropriate activities in an environment thatis planned and organized to meet the needs of all students. The teacher can differentiate oneor a number of the following elements in any classroom learning situation (Tomlinson, 2004):

- The content (what the students are going to learn)
- The processes (the activities)
- The products (the accomplishment following a learning period)
- The learning environment

Differentiation is a process through which teachers enhance learning by matching student characteristics to instruction and assessment. Differentiation allows all students to access the same classroom curriculum by providing entry points, learning tasks, and outcomes that are tailored to students' needs. In a differentiated classroom, variance occurs in the way in which students gain access to the content being taught, the process by which they acquire information, and the manner in which they demonstrate understanding (Hall, Strangman, & Meyer, 2003).

Let us know the strategies of differentiating instruction:

Content: What the teacher plans to teach and what the students need to learn.

The teacher can plan range of activities:

- Students level will be determined through formative assessment
- Using reading materials atvarying readability levels
- Putting text materials on tape/CD
- Using spelling/vocab listsat readiness level of students
- Presenting ideas through auditory, visual, kinaesthetic, & tactile means
- Using reading buddies
- Flex grouping
- Compacting
- Meeting with small groupsto reteach idea/skill, or to extend the thinking/skill

- Multi-levelled questions
- Modelling

Process:

How the students will access the information. Activities in which the students engage in order to make sense of or master the content

Strategies:

- Tiered activities through which all learners work with the same information, understanding, & skills, but proceed with different levels of support, challenge, or complexity.
- Centres/Stations
- Developing personal agendas
- Manipulative
- Varying the length of time a student may take to complete a task
- Cubing
- Learning logs or journals
" Note-taking organizers
- Graphic organizers
- Highlighted materials
- Jigsaw
- Think, Pair, Share
- Learning Menus
- Web quests
- Labs
- Role Play / Simulations

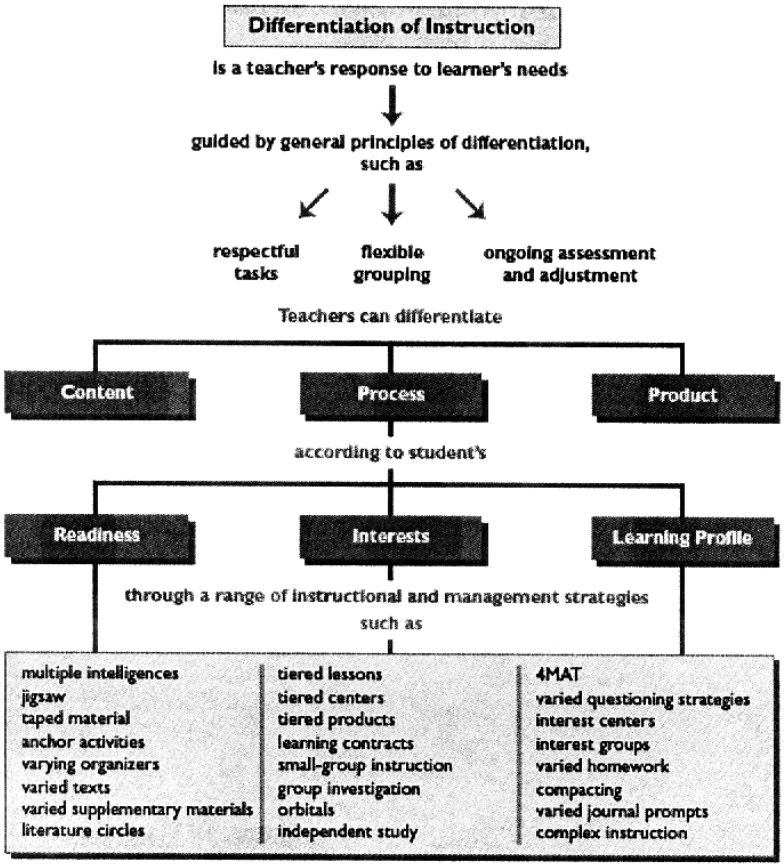
Product: How the student will demonstrate what s/he has learned.

- Choice boards Podcast
- Blog
- Presentation

- Quiz/Test
- Using rubrics that match and extend students' varied skill levels.
- Encouraging students to create their own product assignment as long as it contains required elements.
- Enabling students to use contemporary media/technology as tools to demonstrate knowledge and understanding.

Let us see a graphical presentation of differential of instruction:

Figure 2. A Concept Map for Differentiating Instruction



Conclusion

Differential instruction is an organized, but flexible way of adjusting teaching and learning methods to accommodate each child'slearning needs, interests and preferences specifically children who have learning problems or special need in order to achieve his or hermaximum growth as a learner and provide them best learning experiences.

1.6.2 Universal design of learning:

Learning in general is very person specific, as unique as a person thumb print. Universal design is an architectural concept that focuses on the design of the products, building or environments so that they can be used by all type of people.

The term "universal design" was coined by architect and designer Ron Mace at the Center for Universal Design at North Carolina State University (Burgstahler, 2008; Center for Applied Special Technology, 2011b). Mace and his colleagues defined UD as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Center for Applied Special Technology, 2011a).

With ADA (Americans with Disabilities Act), 1990 Universal design became very popular among architects and designers who were trying to make public building and city streets accessible for all. Though it was basically for the people with disabilities but afterwards it was seen that this concept is very effective among other population also. So the chief characteristic of Universal Design is that it "proactively builds in features to accommodate the range of human diversity" (McGuire, Scott, & Shaw, 2006, p. 173).

- Adaptation and modifications to the products, built environment and streets like audio books, closed captioning TV, trolley case, automatic door openers, curb cuts, entry ramps, universal-height drinking fountains, disable friendly toilet, lift with audio sounds, road signals with audio, low floor buss, signage, Wireless remote controlled power socketsand others-are beneficial to many people including pregnant woman, woman with kids in lap, sick and old people, not just those with disabilities. Indeed, people today routinely use door openers to enter a building

when their hands are full or kids in lap, pregnant women can use low floor bus, foreign language people can use signage for directions and children visiting the hospital can drink water from a fountain without assistance. Similarly, commuters in noisy airports and students in quiet libraries rely equally on TV closed captioning. Each of these conveniences was originally conceived as a disability accommodation.

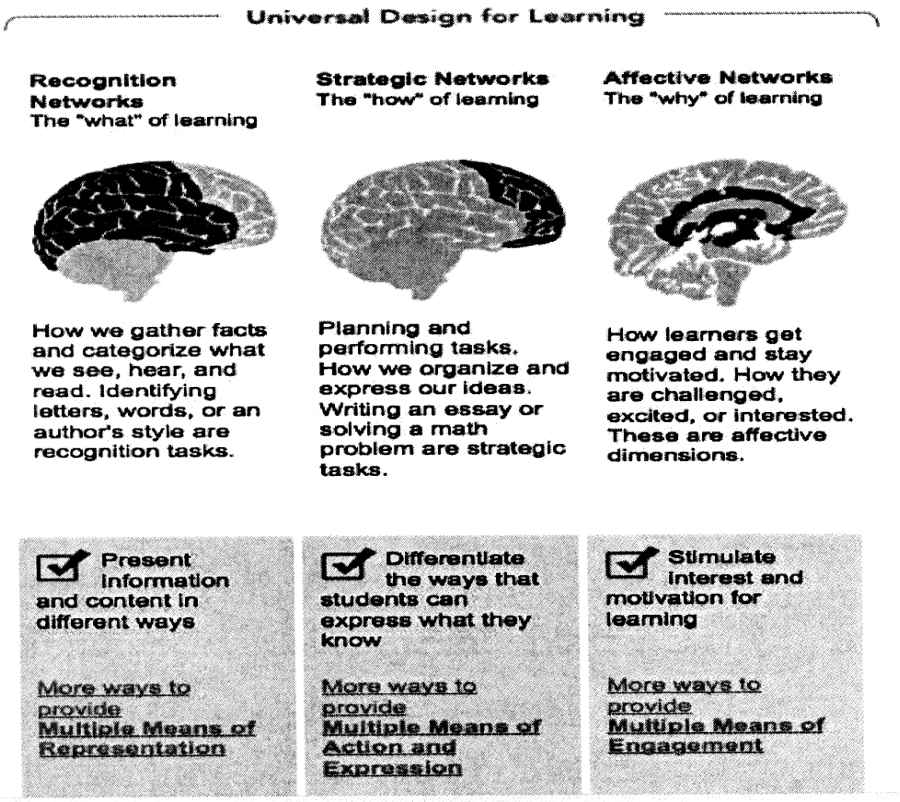
- Disabilities have less to do with individual deficits-what some people can't do that others can-and more to do with environmental barriers that obstruct people's ability to function effectively and participate fully in society (United Nations, 2006 - Preamble E). Universal Design helps all by removing unnecessary barriers.
- The philosophy of UDL has been proved to be fruitful in the field of education also. If the goal of UD is to remove barriers from the physical environment, the goal of UDL is the elimination of barriers from the learning environment. As David Rose, one of UDL's founders, has stated, "UDL puts the tag 'disabled' where it belongs-on the curriculum, not the learner. The curriculum is disabled when it does not meet the needs of diverse learners" (Council for Exceptional Children, 2011).
- A concise definition of Universal Design for Learning was provided by the Higher Education Opportunity Act of 2008, which stated:
- The term UNIVERSAL DESIGN FOR LEARNING means a scientifically valid framework for guiding educational practice that:(A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and(B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.
- Universal Design for Learning is a set of principles for curriculum development that give all individuals equal opportunities to learn. UDL provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone--not a single, one-size-fits-all solution but rather flexible approaches that can be customized and adjusted for individual needs.

The origin of the term Universal Design for Learning (UDL) is generally attributed to David Rose, Anne Meyer, and colleagues at the Center for Applied Special Technology (CAST).UDL is about providing options. In the words of David Gordon, a director at

the Center for Applied Special Technology (CAST), "Options are essential to learning, because no single way of presenting information, no single way of responding to information, and no single way of engaging students will work across the diversity of students that populate our classrooms. Alternatives reduce barriers to learning for students with disabilities while enhancing learning opportunities for everyone" (Council for Exceptional Children, 2011).

Why is UDL necessary?

Individuals bring a huge variety of skills, needs, and interests to learning. Neuroscience reveals that these differences are as varied and unique as our DNA or fingerprints. Three primary brain networks come into play:



Principles of UDL:

I. **Multiple means of representation -** providing learners with various ways to acquire knowledge and information.

II. **Multiple means of expression -** providing learners with alternatives to demonstrate what they know and what and how they think.

III. **Multiple means of engagement -** providing learners with appropriate means of engaging and interacting with the learning environment. The provision is built into the planning and design of all aspects of the activity or unit - not as an add-on.

The approach of Universal Design for Learning can be supported using inclusive technologies.

How UDL can help all students to learn

- Enriches learning environment
- Caters to different learning styles
- Motivates learners and increases productivity
- Engages reluctant learners
- Improves independence and self directed learning
- Enhances self esteem
- Provides indirect and unplanned learning opportunities

How UDL assists teachers

- Helps to make education practices more inclusive
- UDL caters to diverse learners
- Supports effective pedagogy
- Improves the quality of teaching and learning
- UDL makes planning more efficient
- UDL is cost/time effective
- Supports Curriculum Framework
- Consistent with legislation
- Disability Standards in Education 2005
- Education General Provisions Act 2006

Multiple means of representation to support all students

Visual support

- Graphics
- Movies
- Animations
- Text
- Physical objects or movement

Supports visual lestrum Disorder.

Auditory support

- Digital recordings
- Wav or MP3 files
- Text-to-speech

Supports auditory learners as well as students with cognitive impairment, learning difficulties, Dyslexia, speech-language impairment, English as second language.

- Signs - Makaton signs supports students with intellectual impairment
- Auslan and signed English supports students with hearing impairment Captions
- Video captions support students with a hearing impairment

Multiple means of expression

Communication modes - Speech, sign, AAC including speech generating devices, text-tospeech

Writing modes - Pencil and paper - Computer

Visual modes - Sculpture - Photos - Movies - Dance - Drama

Auditory modes - Sounds - Music

Multiple means of engagement

Tools that assist students to actively engage with learning, both input and output. The most successful of these for UDL are those that can engage a diversity of students within the one device or system. Many of these devices will have hidden benefits

HARDWARE - Various configurations of keyboards

- Range of pointing devices
- Trackballs ? Joysticks ? Alternative mouse systems ? Glidepoint ? Touch screens ? IWBs - Digital Pens ? Smartpen ? Intellipen
- Alternative Computer Systems
- Micro laptops ? iPad

SOFTWARE

Configuration of system or software

- Windows/Mac OS
- Wordprocessor configuration
- Writing templates or scaffolds

Rate enhancement software

- Supports students who may fatigue from the mechanics of writing
- Supports students who struggle with reading or writing and may have poor motivation
- Reduces errors in literacy processes
- Increases accuracy, speed, productivity and motivation
- WordTalk; Natural Reader; Co Writer; textHELP

Graphic Organizers

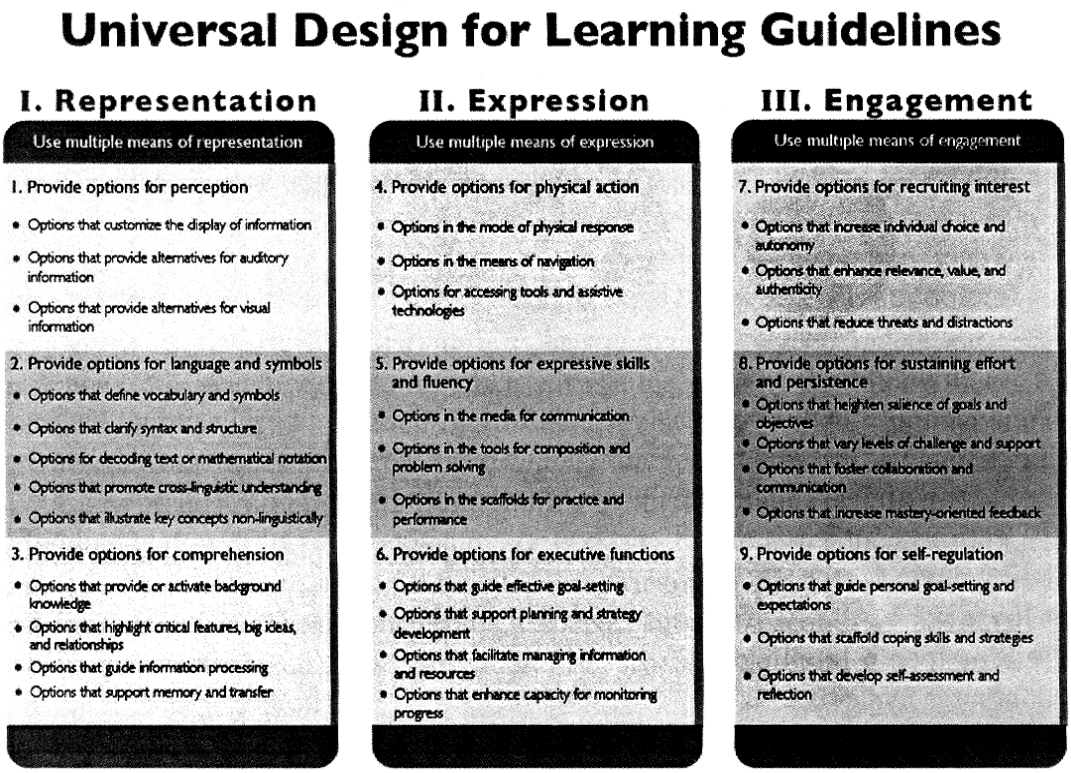
- for students with difficulties organizing information and getting started with writing

Multi-media interactive

- Contain tools and functions that enable a range of students to engage with the learning
- Framework applications (Clicker 5, IntelliTools Classroom Suite, "Communicate" series)
- 'Learning objects' from TLF

An example of how ICT functionality and UDL can address learner differences using multiple means of representation: digitized text

- More flexible than printed materials
- Readily manipulated
- Enlarged text
- Background/foreground colour highlighting
- Recorded sounds or voice
- Graphic support
- Text-to-speech
- Converted to MP3
- Print to Braille printer



Source: CAST

1.6.3 Individualization of instruction:

It is auniversally recognized and accepted effective approach to the teaching-learning

process.It is a teaching methodology that is to be used for a specific purpose and an identified client.It is also called "tailor-planned" mode of instruction.Sometimes termed as programmed instruction alsoif the teaching material follows a "programmed" style of presentation. As this is the era of inclusive education so individualization of instruction is a major trend in the modern educational practices and is the demand of the hour. Based on the psychology of individual differences instructional process also must be organized according to the needs, interests, learning speed and abilities of the learners. To individualize the instructional process we need the help of hardware and software technology both.

Some of the necessary materials and equipments which are used for individualized instructions are 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.
- For students with disabilities assistive aids, Special aid material, equipment and appliances can be used.
- Special provisions and facilities are made for the creative and gifted students to nurture and develop their individual capacities according to their pace and interest.
- Steps of individualized instruction planning:

1. Assessment of student's background, needs and interests
2. Selection of appropriate subject matter
3. Determining the teaching strategies to meet the needs and interests
4. Constant monitoring progress
5. Undertaking revisions/alternative wherever needed
6. Comprehensive evaluation, including qualitative and quantitative records.

Advantages:

1. Success-guaranteed as teaching is based on the interest, needs and abilities of the students and are carefully planned.
2. Teaching learning process will be joyful as students will not be bored with the activities. / Care in planning is important so that the procedure must not be too easy or difficult to accomplish.
3. The student progress is in accordance with his intellectual and social traits.
4. Strong retention of learning
5. Substitution of materials or choice of alternatives activities will be easy since the teacher is considering only one student.
6. Easy to adjust planned progsor and can easily pinpoint problems and guide in overcoming problems. / Problems and errors could easily be observed and instant remedy could be undertaken.
8. Student learns to be more responsible and is ready to suggest alternative activities to suit his needs.
9. Evaluation system will also be individualized to find out the actual individual achievement.

1.7 Implication of differential instruction, UDL and individualized instruction for inclusion:

1.7.1 Concept of Inclusion

As we believe that every child can learn and "If a child can't learn the way we teach, maybe we should teach the way they learn"- Ignacio Estrada

Education makes a person self reliant and independent, so education systems must be designed and organized in such a way that it can meet the varying needs of individual learners, and provide an appropriate education and fulfill the fundamental right to education of each child.

To attain the goal of universalization of elementary education, govt. of India has launched some innovative legislation and policies like IEDC, RTE, RPWD, signed in UNCRPD etc.

The dream of education for all (EFA) cannot be achieved unless all children, including the large population of children with special needs, are provided educational services. Due to disability and varying needs children with special need experience multiple disadvantage in the way of education. Most of the time they are perceived as different and unable to cope with mainstream education and they are kept isolated at home or special schools. But the scenario is being changed with the emergence of philosophy of inclusion, concept of UDL, differential instruction and individualized instruction.

UNESCO Salamanca Statement and Framework for Action (1994) proclaimed that, "Every child has a fundamental right to education and must be given the opportunity to achieve & maintain an acceptable level of learning. Every child has unique characteristics,interest, abilities and learningneeds, educational system should be designed &educational programmes implemented to take into account the wide diversity of these characteristics and needs. Those with special educated needs must have access to regularschools which should accommodate them within a child-centered pedagogy, capableof meeting these needs."

The 1994 UNESCO World Conference also realized this situation when it argued that a school should,

…accommodate all children regardless of their physical, intellectual, social, linguistic or other conditions. This should include disabled andgifted children, street and working children, children from remote ornomadic populations, children from linguistic, ethnic, or cultural minorities and children from other disadvantaged or marginalized area andgroups. (UNESCO, 1994, Framework for Action on Special NeedsEducation, p.6)

These inclusive schools,

… must recognize and respond to the diverse needs of their students, accommodating both different styles of learning and ensuring qualityeducation to all through appropriate curricula, organizationalarrangements, teaching strategies, resource use and partnerships with theircommunities. (UNESCO, 1994, Framework for Action on Special NeedsEducation, p.11-12)

Sebba and Ainscow (1996) have offered a definition of inclusion:

Inclusion describes the process by which a school attempts to respond to all pupils as individuals by reconsidering its curricular organization andprovision. Through this process, the school builds its capacity to accept allpupils from the local community who wish to attend and, in so doing,reduces the need to exclude pupils (p.9).

1.7.2 National and International Legislations Support Inclusive Education :

Let us look at the International legislations in support of inclusion:

Source:World Bank Group: Education Global Practice

Toolkit for master trainers in Preparing Teachers for InclusiveEducation for Childrenwith Special Needs

KEY INTERNATIONAL INITIATIVES SUPPORTING INCLUSIVE EDUCATION FOR CHILDREN WITH DISABILITIES

Date	Title	Key statements
1948	UN Declaration on Human Rights	**Article 26:** Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages.
1989	UN convention on rights of child	**Article 28:** (Right to education): All children have the right to a primary education, which should be free. Wealthy countries should help poorer countries achieve this right. **Article 29:** (Goals of education): Children's education should develop each child's personality, talents and abilities to the fullest.
1990	World declaration on education for all (Jomtien)	**Article 3:** Basic education should be provided to all children, youth and adults. To this end, basic education services of quality should be expanded and consistent measures must be taken to reduce disparities. For basic education to be equitable, all children, youth and adults must be given the opportunity to achieve and maintain an acceptable level of learning.

KEY INTERNATIONAL INITIATIVES SUPPORTING INCLUSIVE EDUCATION FOR CHILDREN WITH DISABILITIES

Date	Title	Key statements
1993	UN standard rules on equalization of opportunities for persons with disabilities	Rule 6: States should recognize the principle of equal primary, secondary and tertiary educational opportunities for children, youth and adults with disabilities, in integrated settings. They should ensure that the education of persons with disabilities is an integral part of the educational system.
1994	Salamanca statement and framework for action on special needs education	Schools should accommodate all children regardless of their physical, intellectual, social, emotional, linguistic or other conditions. This should include disabled and gifted children, street and working children, children from remote or nomadic populations, children from linguistic, ethnic or cultural minorities and children from other disadvantaged or marginalized areas or groups.
2000	Millennium development goals (Set for achievement by 2015)	Goal 2: Achieve universal primary education. Ensure that all boys and girls complete a full course of primary schooling.
2000	World education forum for action, dakar (restated the urgency to reach marginalised groups)	(Restated the commitment of the Salamanca Statement) and: All children, young people and adults have the human right to benefit from an education that will meet their basic learning needs in the best and fullest sense of the term, an education that includes learning to know, to do, to live together and to be.
2001	EFA flagship on right to education for persons with disabilities	The goal of Dakar will only be achieved when all nations recognize that the universal right to education extends to individuals with disabilities, and when all nations act upon their obligation to establish or reform public education systems that are accessible to, and meet the needs of, individuals with disabilities.
2007	UN convention on the rights of persons with disabilities	Article 24: Education States Parties shall ensure an inclusive education system at all levels and lifelong learning directed to: The full development of human potential and sense of dignity and self-worth, and the strengthening of respect for human rights, fundamental freedoms and human diversity; The development by persons with disabilities of their personality, talents and creativity, as well as their mental and physical abilities, to their fullest potential; Enabling persons with disabilities to participate effectively in a free society.

Module 1 : Education

There are various constitutional provisions in India that have promoted mainstreaming ofchildren with special needs into regular schools. Article 21A of the Constitution guaranteeseducation as a fundamental right to all children in the 6-14 age group, while

Section 26 of thePersons with Disabilities Act, (Equal Opportunities, Protection of Rights and Full Participation)Act(1995) articulates that free and compulsory education has to be provided to all childrenwith disabilities up to the minimum age of 18 years. The Government of India's 12th Five-YearPlan considered exclusion the single most important challenge in universalizing elementaryeducation. The Draft Persons with Disabilities Bill (2012) enshrines a strong commitment toinclusive education. Government policies and schemes such as SarvaShikshaAbhiyan(SSA)and Right of Children to Free and Compulsory Education (RTE) Act(2009), have changed the education landscape significantly, resulting in a significant decrease in the number of out-of schoolchildren in the last decade. This has also led to an increasing number of children withdisability entering government and private schools.

SSA's goal is to provide eight years of elementary schooling for all children, including thosewith special needs, in the 6-14 age groups. Children with disabilities in the 15-18 age groups areprovided free education under two national schemes: Integrated Education for Disabled (IEDC) and RashtriyaMadhyamikSikshaAbhijan(RMSA).

The 2001 census reportssays that fifty-one percent of persons with disabilities are illiterate, so India has tocontinue its efforts to provide Education for All (EFA). It is therefore essential that to mainstreamthe children with disabilities effectively into regular schools teachers must betrained in inclusive education, need to learn to apply the principles of UDL, and understand the importance of differential instruction.

1.7.3 Key principles of inclusive education:

- IE is based on the belief that the right to education is a basic human right for all children.
- IE ensures good teaching
- IE is a strategy to implement and fulfil the obligation of RTE
- Providing equal opportunities to all children, which do not mean similar things for all children.
- It isbased on the concept of providing equitable learning opportunities, keeping in mind the differencesand difficulties of the child besides their diverse background and their needs.
- Teaching children from diverse backgrounds requires a tremendous amount of flexibility in teachingpractices and processes as well as in curriculum design and learning materials.
- Ensuring equitable learning opportunities by making the education system accessible and responsiveto all children, including disadvantaged children, i.e. Scheduled Castes/Scheduled Tribes (SC/ST),minority, children with disabilities, girls, urban deprived, and also ensuring their entitlements toachieve optimal learning outcomes.

- IE is a process of addressing and responding to diverse needs of learners by reducing exclusionwithin schools.
- IE is an entry point to improve the quality of the education system in terms of culture, policy andpractices (pedagogy, classroom management, teaching learning materials [TLMs] and the learningenvironment).
- Inclusive teachers are good teachers who are flexible in their approach and believe that the source of difficulties in learning is largely environmental and can be addressed.

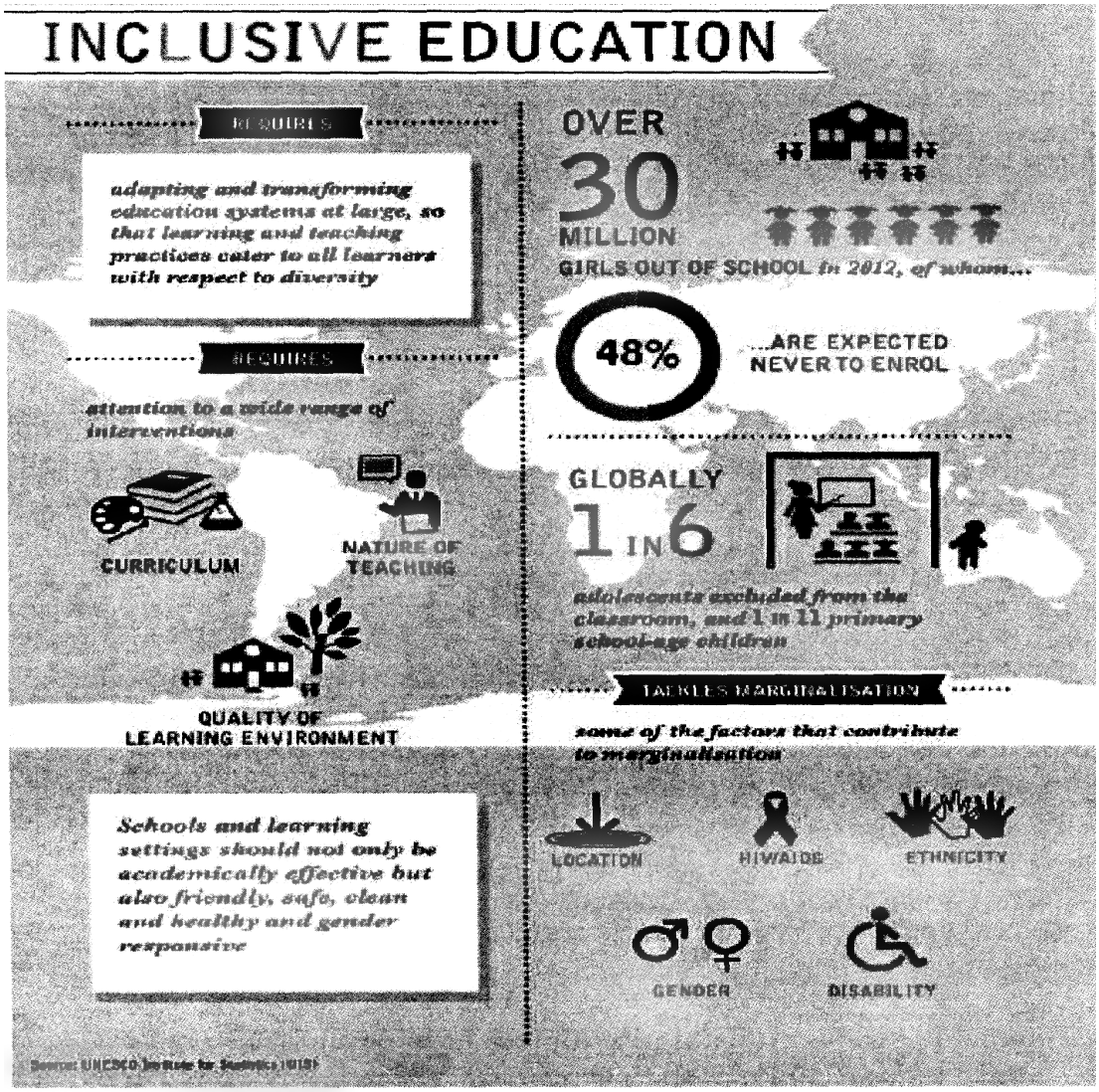


Fig 1.4 illustrates an info graphic on 'Inclusive Education' presented & published by UNESCO at the World Education Forum, 2015

From the above discussion and by looking at the international and national legislation we can clearly understand that inclusion is need of the hour to accommodate all children under the umbrella of education.

With the passing of the rights of the persons with disabilities act (RPWDA) 2016 ON 27TH DECEMBER, 2016, inclusive education has become more than just rhetoric. For example section 16 of chapter III of the RPWDA, is clearly stated about inclusive education,

"The appropriate government and local authorities shall endeavor that all educational institutions funded or recognized by them provide inclusive education to the children with disabilities and towards that end shall

(i) Admit them without discrimination and provide education and opportunities for sports and recreation activities equally with others;
(ii) Make building, campus and various facilities accessible;
(iii) Provide reasonable accommodation according to the individual's requirements;
(iv) Provide necessary support individualized or otherwise in environments that maximize academic and social development consistent with the goal of full inclusion;
(v) Ensure that the education to persons who are blind or deaf or both is imparted in the most appropriate languages and modes and means of communication;
(vi) Detect specific learning disabilities in children at the earliest and take suitable pedagogical and other measures to overcome them;
(vii) Monitor participation, progress in terms of attainment levels and completion of education in respect of every student with disability;
(viii) Provide transportation facilities to the children with disabilities and also the attendant of the children with disabilities having high support needs.

In preamble it is clearly defined that

"Inclusive education" means a system of education wherein students with and without disability learn together and the system of teaching and learning is suitably adapted to meet the learning needs of different types of students with disabilities;

In UNCRPD, Article 24 Education stated that,

(a) Persons with disabilities are not excluded from the general education system on the basis of disability, and that children with disabilities are not excluded from free and compulsory primary education, or fromsecondary education, on the basis of disability;

(b) Persons with disabilities can access an inclusive, quality and free primary education and secondary education on an equal basis with others in the communities in which they live;

(c) Reasonable accommodation of the individual's requirements is provided;

(d) Persons with disabilities receive the support required, within the general education system, to facilitate their effective education;

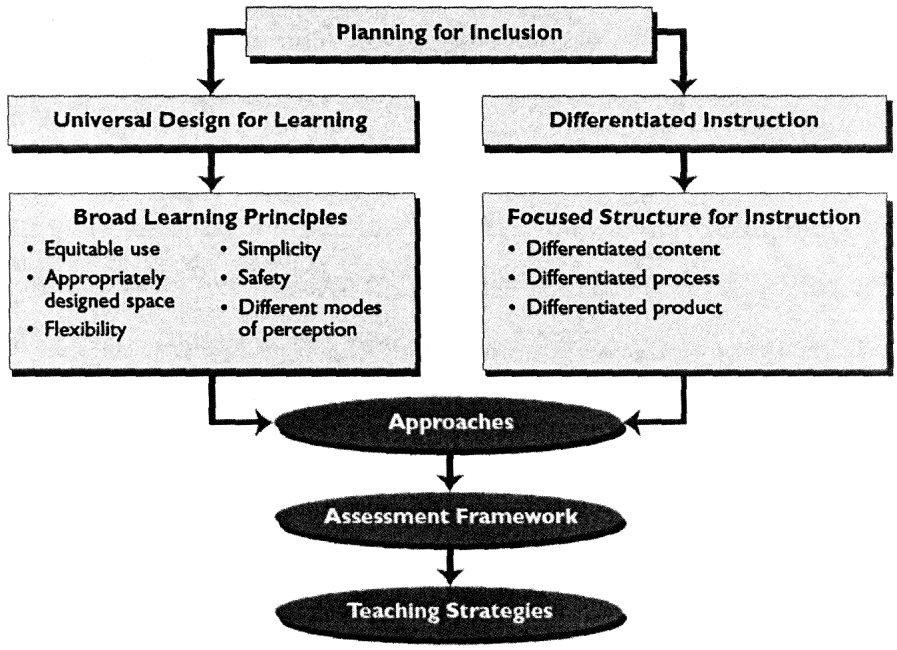
(e) Effective individualized support measures are provided in environments that maximize academic and social development, consistent with the goal of full inclusion.

1.7.4 Educational practices Support Inclusive Education

To make the dream of inclusion successful some strategies are being followed,

- Principles of Effective Instruction
- Universal Design for Learning (UDL)
- Co-Teaching
- Differentiated Instruction
- Curricular Accommodations
- Collaborative learning
- Peer mediated teaching
- Positive Behavior Supports

Planning for Inclusion



Source: Hitchcock et al., 2002.

In the 1990 when UDL was introduced into the education domain as the momentum for inclusive education grew. The fundamental objective of inclusion was to preparean appropriate curriculum to ensure all students can access and participate in the education system. Universal design was clearly relevant to full inclusion. Those who work in the application of UD to teaching and learning invented the term Universal design for learning.

UDL emphasizes development of a curriculum that does not involve adaptation or retrofitting. In other words, it is not an add-on to the standard curriculum.Adjustment of curriculum and modified teachers instruction should be in built from the beginning.

UDL is the exchange of the Power base associated with the transfer of knowledge.UDL gives students control over the way in which they gain access to information, which encourages, their independence in learning and problem solving. It provides for equal access to all by removing barriers to knowledge and learning without diminishing the challenges.

(bauer&kroeger, 2004)

UDL involves the application of three primary principles:

1. Representation- It means using various ways of presenting essential concepts. As there is no single best way of presenting the curriculum that will satisfy the need of all students.For some students only lecture is enough but for some lesson notes are also needed along with the oral presentation.For some other students using graphics, drawings and photographs, even YouTube clips can also help.
2. Engagement - that is ensuring that learning activities must be designed in such a way so that they cater for student's skill levels, preferences and interests. So students must be provided such material which can capture their interests and motivate them in learning.
3. Expression -that is using alternative means of expression that allow students to demonstrate mastery of a topic, skill or acquired knowledge in a variety of way.Some students may write well and some may not, they may even find it difficult to write a simple letter.So providing a range of options that includes written, oral or multimedia presentations like dance, painting, project or even show and tell can help students to demonstrate their achievement of the curriculum goals.

UDL also involves 7 teaching and learning features

1. Equitable use- the same technology or resources will be available to and usable by everyone, example most commercial digital mathematics programs have materials that cover a range of students capabilities

2. Flexible use - the same technology or resource is used for a number ofpurposes, example arithmetic or social or language
3. simple and intuitive application - example everyone knows how to look for a book in the library or use the web to search forinformation
4. Perceptible information - that the technology communicates essential informationto the user regardless of the user's capabilities, example instruction and guidelines or manuals.
5. Tolerance for error - example the learning process includes recovery processes if erroroccurs.
6. Low physical effort - example the teaching process is accessible to studentswith sensory or mobility impairment
7. Size and space - example accommodates students with particular need such as making seating arrangement for a student with visionimpairment at the front of the class.

So UDL is all about tools and resourcesthat are usable by all students in a classroom.

Burgstahler(2001) distilled the initiatives achieved in design and architecture in to a set of featuresrelating to classroom application. These are,

- Inclusiveness - a classroom environment that respects and values diversity
- Physical access - classroom resources and equipment that are accessible to all students.
- Delivery methods -employment of varied instructional methods
- Information access - use of for example captioned videos electronic copies of printed materials etc.
- Interaction- different ways in which teacher and learner interact.
- Feedback - effective and timely prompting and feedback and
- Demonstration of knowledge - multiple ways for students to demonstrate their knowledge.

UDL focuses on curriculum adaptation and ICT and promotes teaching practices that allow for equal access to all students.

Differentiation is a core element of responsive teaching. The concept appears in the professional literature under several heading; curriculum differentiation differentiated

instruction and multi level instruction. Differentiation refers to flexible approach to teaching that address the different capabilities of individual student.

Curriculum differentiation is the management of the,

- Content - what is taught and learnt. (e.g.; by providing activity based task through to the conceptual and abstract)
- process or methods for acquiring content - how knowledge is delivered(e.g.; accommodating preferred learning styles : visual auditory , tactile or kinesthetic)
- method for assessment - how learning success is evaluated (using authentic task that involve real and relevant problems)
- resources required - including material and human resources (e.g.; equipment, ICT teacher aids, volunteers, experts)

The idea of differentiation is not new maker 1982 suggested ways in which the curriculum might be modified to take into account learner's characteristics, their skills and knowledge the pace of presentation, the complexity of the information and the depth of learning required.

Conclusion:

So with the implication of the above strategies inclusive education can be successful. Though there are some Barriers to access education and success inclusion which is physical as well as structural. But more than that, it is the curriculum, the pedagogy, the examination and the school's approach, which create barriers. So we need to take care of those barriers by applying the principles of UD(structural), UDL and differentiated instruction or individualized instruction to make the education accessible to all children.

1.8 Summary:

So we have seen in this unit that educational technology is concerned with the systematic application of science and technology in the field of education. It is helpful for both, the teacher and learner to set the learning objectives, strategies, procedures, materials and establish a good communication between them and make the teaching learning process more effective.

The initiation of educational technology movement started with audiovisual aids (within 'technology in education') and behaviourism and programmed learning (within 'technology of education'). educational technology in India is being used for School

broadcast, TV Telecast lessons, Teacher preparation, Distance education, Correspondence courses, Development of audio- visual materials, Language teaching, Production of multipurpose kits or instructional aids, Computer literacy and studies in schools.

The scope of educational technology is very wide and it is utilized in various areas of teaching and learning process like formulation of educational goals and objectives, Curriculum Development, Developing Teaching-Learning materials and Resources, teacher training, Development of teaching - learning Strategies,Developing Multi-Sensory Aids, Develops Feedback Mechanism, Develops Interactive Instruction Services, Developing Information Resources, Develops Communication Devices etc.

Instructional Technology is a subset of educational technology and it is a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction. It is helpful for both teacher and learner.Instructional Technology can make the instruction more interesting, more standardized, interactive, instant and need based, develops positive attitudes among students.

Educational Technology has bought revolution in the entire education system in our country and also globally with the use of hardware approach, by using various technological aids, like projector, computer, smart phones and many other things; and software approach like using programmed instruction, CAI, CBI etc. With the help of educational technology teaching is not confined within the four wall of classrooms and source of information is not only the teacher, now learner can learn any time anywhere based on their needs and suitability with the help of online learning, online library, internet, blogs, Wikipedia, moodle and many more.

There are three major approaches of Educational Technology namely Hardware Approach (Technology in education), Software Approach (Technology of Education) and System Approach. The use of hardware approach and software approach is very necessary to fulfill present age education needs. To reach large population easily, it is being used in distance mode courses, correspondence courses, online learning, and adult education very effectively. Educational Technology can make the teaching learning process effective and interestingby using multisensory approach, individualized education and reinforcement technique with the help of hardware and software technologies.

System Approach is a modern approach in educational administration and organization and it acts as a link between hardware and software approach. It is concerned with development, implement and evaluation of the whole educational system, sub-system, and curriculum by organizing human resource and physical resource in an effective and economic way to get the best from the education system.

As we are living in the era of information explosion so role of mass media become very important in education sector. Mass media approach in education means to use educational TV, radio, press, newspaper, films, documentaries, internet, educational apps, mobile, etc to reach mass to provide education and also make the learners and teachers modern and up to date.

Differentiated instruction is a teaching theory based on the premise that instructional approaches should vary and be adapted in relation to individual and diverse students in classrooms (Tomlinson, 2001). The teacher can differentiate instructional strategies based on the content (what the students are going to learn), the processes (the activities), the products (the accomplishment following a learning period) and the learning environment.

The term "universal design" was coined by architect and designer Ron Mace at the Center for Universal Design at North Carolina State University (Burgstahler, 2008; Center for Applied Special Technology, 2011b).The term UNIVERSAL DESIGN FOR LEARNING means a scientifically valid framework for guiding educational practice that: (A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and (B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities.

Principles of UDL are 1.Multiple means of representation - providing learners with various ways to acquire knowledge and information. 2. Multiple means of expression - providing learners with alternatives to demonstrate what they know and what and how they think and 3. Multiple means of engagement - providing learners with appropriate means of engaging and interacting with the learning environment.

1.9 Check your Progress

- Explain the meaning and concept of educational technology in detail.
- Explain 'hardware' and 'software' approach to education and their contribution towards effective teaching and learning.

- Differentiate between "technology of education" and "technology in education".
- Describe in detail the scope of educational technology.
- Discuss the recent trends of Educational Technology and Instructional Technology in teaching learning process.
- What is UDL and how it has a wide applicability to make inclusion successful?
- Mention the three primary principles and their uses in inclusive classroom.
- Justify the need of differential instruction for children with special needs.

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Unit 2 ❐ Information and Communication Technology (ICT)

Structure

2.1 Introduction

Information and Communication Technology (lCT) is a generic term, which is being used for collecting, storing, editing and passing on information in various forms.

Although there is no single, universal definition oflCT, the term is generally accepted to mean all devices, networking components, applications and systems that allow people and organizations (i.e., educational agencies, businesses, nonprofit agencies, governments and criminal enterprises) to interact in the digital world. ICT is generally used to represent a broader, more comprehensive list of all components related to computer and digital technologies than IT. The scope oflCT is not fixed, but is responsive to ongoing technological developments.lCT is leveraged for economic, societal and interpersonal transactions and interactions. ICT has drastically changed how people work, communicate, learn and live.

More than three decades ago, computers and related information technologies were introduced to educators for direct teaching and learning purposes.

Learning and teaching whether it is through actual classroom settings or through technological applications utilizes many psychological principles knowingly or unknowingly.

ICT enables interactive and collaborative learning at several and best possible ways. ICT can help the school administrators to improve administrative tasks such as school record keeping system and school information management system.

2.2 Objectives

After going through this unit, you will be able to

- Understand the meaning, definition, scope and significance of ICT
- Understand the psychological bases for ICT among teachers and learners
- Understand stages, requirement and process of development of ICT
- Understand the process of using ICT in developing collaborative networks
- Understand the use of ICT to simplify record keeping

2.3 ICT - Meaning, Definition, Scope and Significance

2.3.1 Meaning and Definistion of ICT

The integration of computers and communications offer unprecedented opportunities to the education system with its capacity to integrate and interact with each other over a wide geographic distance in a meaningful way to achieve the instructional objectives. Increasingly rapid advances in ICT will have profound impact on way teachers teach and how learners learn in near future. The development of new broadband communication services, convergence of telecommunication with computers, recent developments in the field of communication protocol have fostered numerous proposals for the uses of ICT to support the teaching and learning environment. The growth of these communication and computer systems, their ease of use, the power and diversity of information transfer allow teachers and students to have access to a world beyond the classroom. It has the potential to transform the nature and process of the learning environment. Interactivity, flexibility and convenience have become the order of the day in the ICT supported environment. Knowing how to use and integrate ICT in teaching and learning is of utmost importance for teachers in their role of creators of pedagogical environments.

While literature provides some evidence of the effectiveness of using ICT in education, little is known about which learning strategies should be used for education and training. ICT development in education is a continuum approach along which an educational system or institution can be mapped depending on the stages oflCT development. These broad stages have been termed as Emerging, Applying, Infusing and Transforming stages of lCT development.

ICT stands for information and communication technology and is defined as a "diverse set of technological tool and resources used to communicate, and to create, disseminate, store, and manage information."

ICT, or information and communication technology (or technologies), is the infrastructure and components that enable modem computing.

2.3.2 Components of an ICT system

ICT encompasses both the internet-enabled sphere as well as the mobile one powered by wireless networks. It also includes antiquated technologies, such as landline telephones, radio and television broadcast -- all of which are still widely used today alongside cutting-edge ICT pieces such as artificial intelligence and robotics.

ICT is sometimes used synonymously with IT (for information technology); however, ICT is generally used to represent a broader, more comprehensive list of all components related to computer and digital technologies than IT.

The list oflCT components is exhaustive, and it continues to grow. Some components, such as computers and telephones, have existed for decades. Others, such as smart phones, digital TV s and robots, are more recent entries.

ICT commonly means more than its list of components. It also encompasses the application of all those various components. It's here that the real potential, power and danger oflCT can be found.

2.3.3 The scope of ICT

The scope oflCT is not fixed, but is responsive to ongoing technological developments. This is evident in the emergence of advanced internet technology over the past few years and the resulting changes in the ways that students construct with others.

Student develop capability in using ICT for tasks associated with information access and management, information creation and presentation, problem solving, decision making, communication, creative expression, and empirical reasoning. This includes conducting research, creating multimedia information products, analyzing data, designing solution to problems, controlling processes and devices, and supporting computation while working independently and in collaboration with others.

Students develop knowledge, skills and dispositions around ICT and its use, and the ability to transfer these across environments and applications. They learn to use ICT with confidence, care and consideration, understanding its possibilities, limitations

and impact on individuals, groups and communities. Information and Communication Technology is often used as an extended synonym or as an umbrella term for Information Technology (IT), but it is a most specific term that stresses the role unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems,

which enable users to access, store, transmit, and manipulate information. The term ICT is also used to refer to the convergence of audio-visual and telephone networks with computer networks through a single cabling or link system. To some scholars, ICT has no universal definition, as "the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis." The broadness oflCT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form, e.g. personal computers, digital television, email, robots;" therefore, one can say that ICT is concerned with the storage, retrieval, manipulation, or receipt of digital data." ICT delineates how these various forms of digital mediums interact with one another.

Information and Communication Technology can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teacher's professional development and more efficient education management, governance and administration. UNESCO helps a lot in promoting ICT in education.

The scopes oflCT in various education sectors are:

1. Information Technology in Educational Management
2. Lifelong Learning
3. Distance Learning
4. IT-Professional and Vocational Education in Information Technology
5. Advancing community linkages
6. Improving policy planning and management
7. Establishing and sustaining lifelong learning
8. Facilitating skill formation
9. Lively teaching learning process.
10. Those students can fmd information, they need proper instructions, they need scope for creativity, and expectations of the teacher bring forth performance.

11. Helping the student learn.

12. Enhance teaching.

2.3.4 Significance of ICT

ICT is leveraged for economic, societal and interpersonal transactions and interactions. leT has drastically changed how people work, communicate, learn and live. Moreover, leT continues to revolutionize all parts of the human experience as first computers and now robots do many of the tasks once handled by humans. For example, computers once answered phones and directed calls to the appropriate individuals to respond; now robots not only can answer the calls, but they can often more quickly and efficiently handle callers' requests for services.

Pedagogical Usages of ICT

Studies of teaching and learning in schools around the world identify four broad stages in the way the teachers and learners use leT as a support to teaching and learning. More than three decades ago, computers and related information technologies were introduced to educators for direct teaching and learning purposes. It started with presentation software to CAL/CBT/CAI, then moved to multimedia courseware and finally to learning management system using open and flexible learning.

Supporting work performance

In the initial phase, teachers use productivity tools such as word processor, visual presentation software, spreadsheet, database, email etc. to support their daily work performance. In this initial stage, there is usually an emphasis on basic operations of electronic office software. This stage of using productivity tools for teaching and learning is linked with the emerging stage in ICT development

Enhancing teaching

Following on and from using productivity software, comes the stage of learning how to use and develop computer assisted learning software and beginning to make use of such software in different disciplines. This stage involves the technique of integrating computer-based learning in the traditional instructional process, and is linked with the applying stage in the ICT development model. Various instructional packages were selected, developed and used to enhance traditional classroom teaching.

Facilitating learning

The next stage involves using various types of instructional software to facilitate student learning. The key point is that the teachers need to learn how to choose the most

appropriate tools for a particular task, and using these tools in combination to solve real life problems. This stage implies the ability to recognize situations where various multimedia, simulation and modeling software can be utilized for teaching and learning. This stage is linked with the infusing stage in the ICT development model.

Creating innovative learning environments

The fourth and last stage involves specializing in the use of network based resources to create meaningful environment with rich affordable for innovative learning models so that it occurs when one enters more deeply into the shared learning environment that creates and transforms the learning situation. This is a completely new way of approaching teaching and learning using technology. It helps to develop, deliver and manage open & flexible learning program. This stage is linked with the transforming stage in the ICT continuum model.

2.3.5 Functional Approach of leT Usage

Several attempts have been made to classify the functions of ICT in education in the literature, However, the most comprehensive and well defined classification describes the following functions of the use of ICT in education:

(a) ICT as Object (b) ICT as Assisting Tools (c) ICT as Management of Learning and (d) ICT as Medium of Teaching & Learning.

ICT as Object

It refers to learning about ICT. Mostly organized in a specific course. What is being learned depends on the type of education and the level of the students. ICT curriculum prepares students for the future occupation and social life. There are various types of short term, long term and modular courses being offered in this area to satisfy the ever growing demand of skill personnel in the software industry.

ICT as an Assisting Tool

ICT is used as a tool, for example while making assignments, collecting data and documentation, communicating and conducting research. It is independent from subject content. Generic assisting tools may be general or specialised in their application. Some of the examples of generic tools have been described below:

Word Processing and Publishing Tools-preparing, editing and producing written, tabular and graphical material;

Freehand and Geometric Drawing Tools-devising and producing pictorial representations of events, ideas and art effects;

Database Tools-searching, storing, categorizing and arranging data and information;

Statistical Analysis and Modeling Tools-deducing trends and patterns, organizing and synthesizing information;

Multimedia and Authoring Tools-capturing, editing, modifying integrating text, graphics, audio & video information;

Simulation Tools-devising and testing ideas and hypotheses, and projecting future consequences;

Animation Tools-creating editing and modifying 2D and 3D animation.

2.3.6 ICT as Medium of Teaching and Learning

This refers to ICT as a tool for the purpose ofteaching and learning itself. More than three decades ago, computers and related information technologies were introduced to educators for direct teaching and learning purpose. It started with CAL/CBT/CAI, then moved to Multimedia courseware and fmally to Web Based instruction & Computer Mediated Communication (CMC) system. Using CAI for drill and practice of basic skills can be highly effective according to a large body of data and a long history of use. Students usually learn more, and learn more rapidly, in courses that use computer assisted instruction (CAI). Thishas been shown to be the case across all subject areas, from preschool to higher education, and in both regular and special education classes. Effective instruction requires presenting information, guiding the leamer, practice, and assessment of student learning. The use of a computer to provide any combination of these factors may be termed computer-assisted instruction. It should be noted that there is no requirement that the computer provides all of these elements. Rather, any combination of these can be appropriate computer intervention in the learning process. Interactivity, flexibility and learner control is the hallmark of these technologies. The application of educational technologies to instruction has progressed beyond the use of basic drill and practice software, and now includes the use of complex multimedia products and advanced networking technologies. Today, students use multimedia to learn interactively and work on class projects. They use the Internet to do research, engage in projects, and to communicate. The new technologies allow students to have more control over their own learning, to think analytically and critically, and to work collaboratively. An increasing body of evidence suggests positive results of the ICT integration with teaching and learning. The type, features, styles, usage and pedagogical base of these transformations from CAL to WBI has been described below.

Type: Computer Assisted Learning (CAL)

Features: Interactivity, Flexibility and Leamer Centered

Styles: Drill & Practice, Tutorials, Simulation and Instructional Games

Usage: Self Paced Instruction

Pedagogical Base: Primarily Behavioral Objectives

Type: Multimedia Based Instructional Software

Features: Interactivity & Multi model Instruction

Styles: Drill & Practice, Tutorials and Simulation & Modeling

Usage: Self-Paced Instruction

Pedagogical Base: Primarily Behavioral Objectives & Constructivism

Type: Web Based Instruction

Features: Interactivity, Just in time & On demand Instruction

Styles: Computer Supported Collaborative Learning Environment

Usage: Asynchronous & Synchronous Virtual Class Room

Pedagogical Base: Primarily Constructivism

2.4 Psychological Bases for ICT among Teachers and Learners

2.4.1 Different psychological principles

The fast budding influence of Information and Communication Technology (lCT) and e-leaming in content development and content delivery can be seen in every sector of education. Learning and teaching whether it is through actual classroom settings or through technological applications utilizes many psychological principles knowingly or unknowingly. The most commonly used or heard Schools of Psychology are Behaviourism, Cognitivism and Constructivism. All these schools of psychology are developed based on theories formulated by many psychologists and are being effectively applied in actual classroom situations. However, the application of these psychological principles in e-Learning is not much thought of. e-Learning could be more efficient and effective by the contextual use of different psychological principles.

An innovative application of computer in the pedagogy and learning process is e-learning. E- Learning may be network based, intranet based or internet based, which includes

text, video, audio, animation and virtual environments. The facility of Internet and Intranet enables e-learning that allows learning anytime and anywhere. E-Learning provides faster learning at reduced costs, increased access to learning and clear accountability for all participants in the learning process. The fast budding influence of Information and Communication Technology (lCT) and e-learning in content development and content delivery can be seen in every sector of education.

The American Society for Training and Development (ASTD) defines e- learning as a broad set of applications and processes which include web-based learning, computer-based learning, virtual classrooms, and digital. The definition of e-leaming varies depending on the organization and how it is used; but basically it involves electronic means of communication, education, and training.

Learning and teaching whether it is through actual classroom settings or through technological applications utilizes many psychological principles knowingly or unknowingly. Some of the predictions about the future of education tend to focus not so much on the technology, but on the intersection between pedagogy and technology, and its effect on psychology, epistemologyand teaching praxis. The most commonly used or heard Schools of Psychology are Behaviourism, Cognitivism and Constructivism. The early use of technology in educational settings reflected a behaviourist view of teaching and learning. Behaviourism discusses behaviours that can be observed and does not fully consider the thought processes that go on in the leamer's mind. Cognitivism differ from behaviourism in that it deals with the internal mental processes of the mind and how these processes could be used to endorse effective learning.

We know that 'Learning is relatively permanent changes of behavior through some experience'.

2.4.2 Use of ICT in education from the point of view of learning

ICT is used in education for supporting students" learning or for development of cornpetences, in other words for helping to reach the goals of education. The quality of learning depends on how ICT is used in learning. According to Bransford, Brown, & Cocking (1999) meaningful learning engages students in tackling the topic to be learnt in such a way that they create meaningful and understandable knowledge structures on the basis of a goal for learning. Based on them, it is possible to present an outline of learning with a specific focus on leT use in learning.

Learning represents each individual learner's own personal knowledge construction process which presupposes each learner's active, goal-oriented and feedback-seeking

role. The constituents of meaningful learning are the following: activity, intention, contextualization, construction, collaboration, interaction, reflection, and transfer. These serve as development and selection criteria when choosing teaching and learning activities emphasizing ICT use.

Activity and intention mean that students take responsibility over their own learning. Thus they set, together with a teacher, their learning goals and proceed according to the plan to reach the goals they set. This process may be facilitated, for example, by guiding students to plan by themselves or in small cooperative groups. On the other hand, students neither master the logical structure of the subject nor recognise their own biased preconceptions, and therefore students goal setting needs to be supported and guided by the teachers. Thus, activities that support co-operative planning and evaluating learning are important for learning. Learning could also be enhanced by self-evaluating activities.

Bransford and Donovan (2005) emphasis the role of self-evaluation in learning. They suggest that a teacher should provide support for students self-evaluating for example by giving them opportunities to test their ideas by building things or making investigations and seeing then whether their preliminary ideas were working. Feedback is important for learning.

Reflection means that students examine their own learning and develop metacognitive skills to guide and regulate their learning. Metacognitive skills are necessary for planning and evaluating one's own work. These skills make also learning a self-regulatory process in which the student becomes less dependent of the teacher. For example, self-evaluating or evaluating in a small group, taking multiple-choice tests, doing exercises and consulting answer keys support developing reflective and, moreover, metacognitive skills.

Collaboration and interaction mean that students actively take part in group activities and support each other by discussing and sharing knowledge. Learning new concepts presupposes a dialogue both between the teacher and the students and amongst the students (explaining, debating, questioning). In addition to face-to-face interaction ICT offers several possibilities to share ideas through newsgroups, email, a LMS, or through social media like Face book.

Construction means that students combine their earlier knowledge with the new topics to be learnt and thereby tailor information structures that they can comprehend. Therefore, the teacher should encourage students to bring up their . previous views and beliefs and thereby construct new knowledge on the basis of this shared information. For

example, prior to starting reading or writing, students need to be guided to bring up their prior views on the subject to be dealt with. Respectively, before an investigation or other practical activity students should be encouraged to present his or her prediction or even supposition.

Contextualization means that learning takes place in real life situations or in situations simulating real-life instances. This in turn presupposes that the learning setting allows for authentic and real-life learning experiences. For example, when using a search machine (Google), students should be encouraged to look information in different sources. This enables them to treat the concepts in various contexts and thereby deepen the meanings these concepts acquire. It pays off also to keep in mind that the quality of all Internet-based sources needs to be checked carefully to ensure that the facts are right (source criticism).

From the point of view of interestingness, the context in which science ideas are learned, rather than the ideas themselves, has important influence on learning. For example, when writing it is crucial that students write to prospective readers other than their teacher.

Learning is cumulative and, therefore, students are aided in noticing how a new concept or skill is related to other already familiar concepts or the network of concepts or skills. Learning of science process and ofICT skills are similar processes. In both areas there are low level and high level skills. For example, before a student learns to use a LMS he or she should learn to use word processing and a search machine. Consequently, students should be supported in learning new skills and in internalizing the new concepts and in building conceptual networks in the given field.

The previous characteristics of learning activity may be realized through the use ofICT. For example, by employing the Internet in the inquiry-based learning, students have access to meaningful information of the topic. When looking up information in varied sources, students at the same time actively structure the flow of information they encounter into meaningful entities in order to be able to complete tasks. Similarly, this exploration of information in varied sources forces students to evaluate the reliability of both the information and the sources they use. Within an activity students could be encouraged to work together and also to systematically evaluate their activities. Several studies have indicated that information processing, inquiry-based learning, and exploring resources via networks, are beneficial for education (Linn, 2003).

2.4.3 Use ofICT in teacher education from the point of view of motivation

ICT could be used in education for supporting the development of students" motivation.

There are many concepts that can be used to describe motivational aspects of teaching and learning. Here we base our analysis on Self Determination Theory (SDT) (Ryan & Deci, 2000) and Theory of Interest (Krapp, 2007).

According to SDT, a student's way of thinking has an important role in the process of motivation.

Motivated behaviour may be (i) self-determined or (ii) controlled and they involve different reasons for behaving.

Self-determined or autonomous behaviour is behaviour which arises freely from one's self.

Controlled behaviour, in contrast, means that the behaviour is controlled by some interpersonal or intrapsychic force, like a curriculum or a task.

The motivation styles in SDT are: (i) amotivation, (ii) extrinsic motivation and (iii) intrinsic motivation.

Intrinsic motivation has positive effects on learning, in particular, to the quality of learning. Intrinsically motivated behaviours are based on the need to feel competent and self-determined (Deci & Ryan, 2000).

Extrinsically motivated behaviour is instrumental in nature. Such action is performed for the sake of some expected outcome or extrinsic reward or in order to comply with a demand.

Central to SDT is the concept of basic psychological needs assumed to be innate and universal. These needs are the need for autonomy, the need for competence, and the need for relatedness (need to belong to a group). The fulfillment of need for competence is especially problematic in the case of ICT because the required studies are perceived as being difficult. This perceived lack of competence has an effect on interest and motivation. Furthermore, the interest of the student in a learning activity has an effect to motivation. Consequently, the features of a learning activity and behaviour of a teacher (trainer) could increase the motivation of a learner (student teacher). This is because self- determined learning occurs when a learning activity itself supports fulfillment of basic psychological needs or development of interest. A closer analysis on motivational aspects is based on SDT; ICT is used for motivating or for increasing students' interest for learning. How motivating learning with ICT is for students depends on how ICT is used in this context.

Interest is a content-specific motivational variable (Krapp, 2007). Interest is approached from two major points of view. One is interest as a characteristic of a person (personal

interest) and the other is interest as a psychological state aroused by specific characteristics ofthe learning environment (situational interest). Personal interest is topic specific, persists over time, develops slowly and tends to have long-lasting effects on a person's knowledge and values (Hidi, 1990). Pre-existing knowledge, personal experiences and emotions are the basis of personal interest (Schiefele, 1991).

Situational interest is spontaneous, fleeting, and shared among individuals. It is an emotional state that is evoked by something in the immediate environment and it may have only a short-term effect on an individual's knowledge and values. Situational interest is aroused as a function of the interestingness of the topic or an event and is also changeable and partially under the control of teachers (Schraw & Lehman, 2001).

Although students themselves primarily produce their motivation, it can be enhanced and learned. In practice, a teacher can offer optimal challenges and rich sources of motivating stimulations through choosing the learning activities. Therefore, in addition to previously discussed features of self-determined and controlled behaviour of a leamer, it is appropriate to analyse also features of a learning activity which could increase motivation of a learner. This is because self-determined learning occurs when learning activity itself is considered as

interesting, enjoyable, or personally important by a learner. From the point of view of the SDT, the motivational features of a learning activity could be classified in five categories:

I. autonomy-supporting activities/teacher, through

- choosing student-centred learning methods like "open ended" inquiry and other tasks where stuents have some choices how to plan or study.
- collaborative learning activities which support feeling of autonomy,
- co-planning of the learning activities.

II. Use of lCT where students have

- choices, possibilities for planning and evaluating one's own activities, and
- support to the feeling of effectiveness and importance of working.

III. Support to students' feeling of competency, through

- choosing inquiry and other tasks, which are possible for the student to solve;
- choosing and using constructive evaluation methods, like self assessment, portfolio evaluation

- informal discussions, which help students to recognise that they are good at an activity or do the activity well,
- giving support to the feeling that the activity has some value or use for the student.

IV. Support to students' social relatedness, through

- choosing tasks, collaborative learning activities, co-planning, and ICT use which help students to feel close to peers
- giving support to the feeling that the students can trust each other and feel themselves close to each other,
- supporting the formation of learning communities over social media and various forms of networking

v. Support to interest and enjoyment, through

- waking up curiosity by choosing surprise-evoking inquiry and other activities or tasks,
- organising enjoyable, fun-evoking and interesting activities, like through choosing interesting web pages or simulations,
- choosing activities which hold attention,
- interesting content (new materials or new knowledge) and context (human being, occupations.e technology, or history).

2.5 Development of ICT - Stages, Requirment and Process

2.5.1 Stages of ICT development

Countries in the various region of the world are at different stages of ICT development, in terms of both infrastructure and application of ICT in teaching and learning. Within any such country, there may be uneven development from region to region, area to area, and even from institution to institution.

In view of the above considerations, it is useful to have a model for ICT development for developing competency standards for teacher development. Such a model can be a representation of the essential characteristics of ICT development to provide a scaffold or a framework. It can also be useful to show the inter-relationship of various components within a system and thus helping to locate its position in the whole framework.

Based on the UNESCO publication, a model has been presented that can be useful in

determining the stage oflCT development reached by a country, a district, or even an individual institution. As mentioned earlier, this model is derived from international and national studies oflCT development that have identified a series of broad stages that educational system and institutions typically proceed through, in the adoption and use of ICT. The model is presented here to provide a framework for stages of pedagogy technology integration.

Studies of leT development in both developed and developing countries identify at least four broad approaches through which educational systems and individual institutions typically proceed in their adoption and use of JC'T. Sometimes, the number of stages identified varies, though there is a general consensus that the introduction and use of IC]' in education proceeds in broad stages that may be conceived as a continuum or series of steps. These steps, termed Emerging, Applying, Infusing, and Transforming, are elaborated in Figure 1.

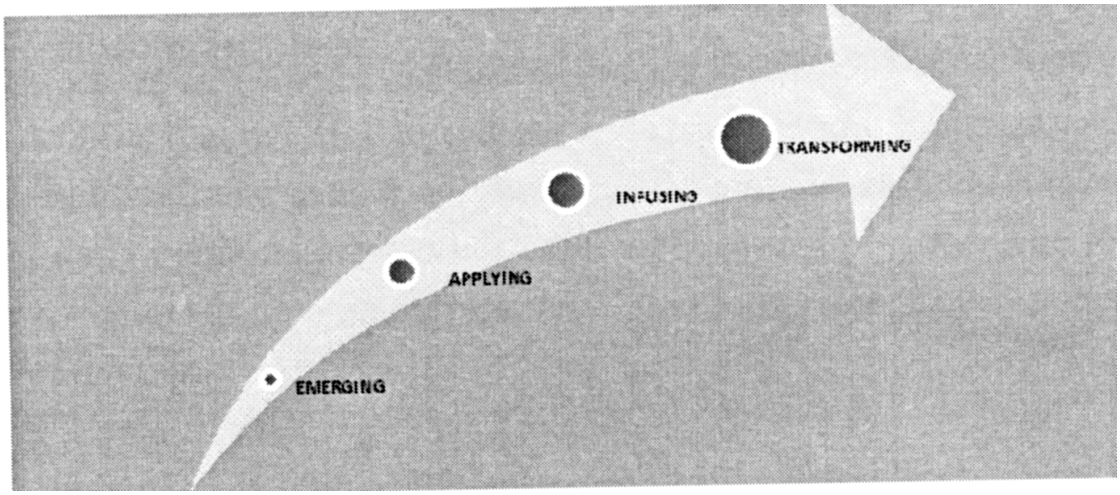

Figure 1: Stages of ICT development

Emerging Stage:

Schools at the beginning stages of leT development demonstrate the emerging approach. Such schools have just started on their journey in the leT field with a skeleton computing infrastructure either donated or purchased by the school authority. In this initial phase, administrators and teachers just start to explore the possibilities and consequences of using leT for school management and adding leT to the curriculum.

Applying Stage:

Those schools, in which a new understanding of the contribution of K'T to learning

has developed, exemplify the applying approach. In this secondary phase, administrators and teachers use leT for tasks already carried out in school management and in the curriculum. Schools at the applying approach phase adapt the curriculum in order to increase the use oflCT in various subject areas with specific tools and software such as drawing, designing, modelling and application specific tools.

Infusing Stage:

At the third stage, the infusing approach involves integrating or embedding ICT across the curriculum, and is seen in those schools that now employ a range of computer-based technologies in laboratories, classrooms, and administrative offices. The curriculum begins to merge subject areas to reflect real-world applications. In the infusing approach to ICT development, ICT infuses all aspects of teachers' professional lives in such ways as to improve student learning and the management of learning processes.

Transforming Stage:

Schools that use ICT to rethink and renew school organization in creative ways are at the transforming approach. ICT becomes an integral though invisible part of daily personal productivity and professional practice. The focus of the curriculum is now leamer-centered that integrates subject areas in real-world applications.

2.5.2 Characteristics of schools related to ICT development

Along with approaches to ICT development noted above, there are various characteristics of schools, or aspects of school leadership, that relate to a school's progress in ICT development. Below are general descriptions of the more important of these characteristics of schools that have an effect on ICT development within schools.

Vision

Vision refers to the aspirations and goals of both individuals within a school and the school system as a whole. As the school advances, the mission statements should become clearer and provide a basis for decision-making. Mission statements should help individual members of the learning community visualize a school's aspirations for the future and act in harmony.

Philosophy of learning and pedagogy

Ways in which teachers and students interact and how the school is managed for learning are part of what is meant by a school's philosophy of learning and pedagogy. These philosophies will necessarily characterize the ways in which ICT is incorporated into a

school. A setting that is dominated by the teacher as the main provider of subject content is adopting a teacher-centred

philosophy.

The teacher controls the use oflCT in such a setting as well. A learner centred philosophy, by contrast, describes a setting where content comes from a variety of resources, and where projects are chosen and designed by the students.

ICT tools and resources are selected by students in ways that match the aims of a project best. These contrasting approaches to pedagogy are sometimes referred to as instructivist and constructivist respectively.

Development plans and policies

How a school's vision and teaching philosophies are carried out is translated into development plans and policies. In the detailed steps of such plans and policies, goals and objectives are further defined providing interim and long-term targets. Policies are set, a budget is allocated, facilities are determined, roles are defined, tasks are delegated, and an evaluation plan is created to define the direction ICT development will take.

Facilities and resources

The learning environment in which ICT is used requires certain facilities and resources. Facilities include basic infrastructure such as electrical wiring, Internet access, lighting, air-conditioning, and space. Decisions on inclusion or lack of ergonomic design and choice of furniture impact not only on use of ICT, but also on the health and well being of users. Resources include various types of technological devices from computers with peripherals, video equipment, and specialized tools like digital microscopes. Further resources include various types of software, as well as traditional tools like books, videos, and audiotapes.

Understanding the curriculum

An understanding of the curriculum affects the progression of ICT in the curriculum in following various stages of development.

First, is an awareness stage in which students become ICT literate with regard to what technology is available and how it might be used.

Second, as students learn basic skills, they begin to apply various ICT tools to their regular learning assignments and projects.

Third, as students become more capable and confident with ICT, they begin to integrate and overlap both subject areas and tools.

Last, is the applied use oflCT in which students are now enabled to address larger, more complex, real-world professional issues.

Professional development of school staff

In parallel with the curriculum for students, there must be professional development of the staff within a school. The personal productivity and professional practice of teachers are enhanced with the use of ICT.

First, is an awareness stage in which teachers and staff become ICT literate with regard to what technology is available and how it might be used.

Second, as teachers and staff learn basic skills, they begin to apply various ICT tools to their regular tasks and projects

Third, as teachers and staff become more capable and confident with ICT, they begin to integrate and overlap both subject areas and tools.

Last, is a change in professional practice in which teachers are now enabled to design lessons to incorporate larger, more complex, real-world projects using ICT tools and resources.

As ICT is introduced into school systems, there is a tendency to move from discrete skills training to reflective practice and integrative professional development. Budgetary allocation and provision for release time for teacher professional development seriously impact on the ability of a school system to incorporate ICT in a meaningful way.

Community involvement

Community involvement may include parents, families, businesses, industry, government agencies, private foundations, social, religious and professional organizations, as well as other educational institutions such as vocational schools and universities. Community involvement can come in the form of donations of equipment and resources, or may be in human resources provided for training and technical assistance. As a community contributes to a school, so the school can give back in many ways. For example, a school may decide to provide community members with evening access to computer labs, or have students offer training to parents. The use of ICT provides an opportunity for a school and its students to interact with both local and global communities. Interaction may range from building web sites for community organizations, to sharing projects with remote schools.

Assessment

Assessment includes both assessments of students as well as overall evaluation of a school system, two aspects that are intricately interwoven. An improvement in the one should predicate an improvement in the other. Means of student assessment should reflect choices in learning pedagogy and an understanding of ICT in the curriculum. For example, in the emerging and applying stages of ICT, assessment may be linked to pencil and paper tests, whereas in the infusing and transforming stages project based portfolios may be more appropriate. Each part of a school system needs to be evaluated to determine its impact on learning. Assessment should inform practice and support the management of learning. Assessment should allow a system to determine whether outcomes have been met, and then reviewed and revised accordingly. Budget allocations, policies, and procedures for ICT should match vision, teaching philosophies, and curriculum choices.

2.5.3 Process of ICT development

Teaching and learning are best thought of, not as separate and independent activities, but rather as two sides of the same coin, interconnected and interrelated. Studies of teaching and learning in schools around the world identify four broad stages in the way that teachers and students learn about and gain confidence in the use of ICT.

Discovering ICT tools

The first stage that teachers and learners go through in ICT development is of discovering leT tools and their general functions and uses. In this discovery stage, there is usually an emphasis on ICT literacy and basic skills. This stage of discovering ICT tools is linked with the emerging approach in ICT development.

Learning how to use ICT tools

Following on from the discovery of ICT tools comes the stage of learning how to use ICT tools, and beginning to make use of them in different disciplines This stage involves the use of general or particular applications of ICT, and is linked with the applying approach in ICT development.

Understanding how and when to use ICT tools

The next stage is understanding how and when to use ICT tools to achieve a particular purpose, such as in completing a given project. This stage implies the ability to recognize situations where ICT will be helpful, choosing the most appropriate tools for a particular

task, and using these tools in combination to solve real problems. This stage is linked with the infusing and transforming approaches in ICT development.

Specializing in the use of ICT tools

The fourth and last stage involves specializing in the use oflCT tools such as occurs when one enters more deeply into the science that creates and supports ICT. In this stage students study ICT as a subject to become specialists. Such study concerns vocational or professional education rather than general education and is quite different from previous stages involving the use of ICT tools.

2.6 Use of ICT in Developing Collaborative Networks for Sharing and Learning such as -internet, E-mail, Tele-teaching, Teleconferance

2.6.1 ICT in developing collaborative network:

The potential of each technology varies according to how it is used. Haddad and Draxler identify at least five levels of technology use in education: presentation, demonstration, drill and practice, interaction, and collaboration.

Each of the different ICTs-print, audio/video cassettes, radio and TV broadcasts, computers or the Internet-may be used for presentation and demonstration, the most basic of the five levels. Except for video technologies, drill and practice may likewise be performed using the whole range of technologies.

On the other hand, networked computers and the Internet are the ICTs that enable interactive and collaborative learning best; their full potential as educational tools will remain unrealized if they are used merely for presentation or demonstration. ICTs stand for information and communication technologies and are defmed, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephone to be used and their modalities of use.

2.6.2 Teleconferencing and its educational use:

Teleconferencing refers to "interactive electronic communication among people located at two or more different places." There are four types of teleconferencing based on the nature and extent of interactivity and the sophistication of the technology:

1) Audio conferencing;

2) Audio-graphic conferencing,

3) Videoconferencing; and

4) Web-based conferencing.

Audio conferencing involves the live (real-time) exchange of voice messages over a telephone network. When low-bandwidth text and still images such as graphs, diagrams or pictures can also be exchanged along with voice messages,

then this type of conferencing is called audio graphic. Non-moving visuals are added using a computer keyboard or by drawing/writing on a graphics tablet or whiteboard. Videoconferencing allows the exchange not just of voice and graphics but also of moving images. Videoconferencing technology does not use telephone lines but either a satellite link or television network (broadcast/cable).

Web-based conferencing, as the name implies, involves the transmission of text, and graphic, audio and visual media via the Internet; it requires the use of a computer with a browser and communication can be both synchronous and asynchronous.

Teleconferencing is used in both formal and non- formal learning contexts to facilitate teacher-learner and leamer-learner discussions, as well as to access experts and other resource persons remotely. In open and distance learning, teleconferencing is a useful tool for providing direct instruction and learner support, minimizing learner isolation. The audio-graphic teleconferencing network aims to provide continuing education and academic upgrading to nurses in parts of Tianjin municipality where access to nursing education has been extremely limited. Various higher education institutions using teleconferencing in their online learning programs include the Open University of the United Kingdom, Unitar (Universiti Tun Abdul Ruzak) in Malaysia, Open University of Hong Kong, and Indira Gandhi National Open University.

2.6.3 Telecollaboration

Online learning involving students logging in to formal courses online is perhaps the most commonly thought of application of the Internet in education. However, it is by no means the only application. Web-based collaboration tools, such as email, message boards, real-time chat, and Web-based conferencing, connect learners to other learners, teachers, educators, scholars and researchers, scientists and artists, industry leaders and politicians-in short, to any individual with access to the Internet who can enrich the learning process.

The organized use of Web resources and collaboration tools for curriculum appropriate purposes is called telecollaboration. Judi Harris defines telecollaboration as "an

educational endeavor that involves people in different locations using Internet tools and resources to work together. Much educational telecollaboration is curriculum-based, teacher-designed, and teacher-coordinated. Most use e-mail to help participants communicate with each other. Many telecollaborative activities and projects have Web sites to support them." The best telecollaborative projects are those that are fully integrated into the curriculum and not just extra-curricular activities, those in which technology use enables activities that would not have been possible without it, and those that empower students to become active, collaborative, creative, integrative, and evaluative learners (see Table 1).There are currently hundreds of telecollaborative projects being implemented worldwide and many more that have either been completed or are in development.

2.6.4 Use of radio and TV broadcasting in education:

Radio and television have been used widely as educational tools since the 1920s and the 1950s, respectively. There are three general approaches to the use of radio and TV broadcasting in education:

- *direct class teaching,* where broadcast programming substitutes for teachers on a temporary basis;
- *school broadcasting,* where broadcast programming provides complementary teaching and learning resources not otherwise available; and
- *general educational programming over community,* national and international stations which provide general and informal educational opportunities.

2.6.5 Internet

The Internet has introduced improvements in technology, communication and online entertainment, but it is also incredibly useful for education purposes as well. Teachers use the Internet to supplement their lessons, and a number of prestigious universities have opened up free online lectures and courses to everyone. It has even allowed retired teachers to read to and educate children in poorer countries. Widespread use of the Internet has opened up a substantial amount of knowledge to a much broader range of people than ever before.

The development of Internet technologies has raised the education level in all countries and it has changed the way students are being taught at schools. That's why it is very important for the present generation that they provide internet education for their young generations.

Internet applications respond to students and other people questions in real time. Students are seeing Google as a new Teacher and the Internet as a school. That's why it is important for teachers to use information technology in education

The Internet has been crucial in the evolution of our education system in various ways. Teachers can use the internet as a modern tool for education. Education department should provide the infrastructure that teachers and student can use to get benefits of technology in education

Students are always curious and creative by nature. They are smart enough to know how they can use the internet to search for almost anything. It doesn't matter if they are studying at a private school or government school. But at the same time, there is a difference in the ways they use the internet for education in schools. In private schools, teachers will teach about computer and internet skills to students. The students note the homework that needs to be done related to that computer class. And do you know how some students do this? They are forced to go to a cyber cafe with their parents to collect data that they have to include in their assignments. This is not good. If students are taking the help of cyber boy to collect the data for their homework I don't think these students learned anything in this process. But the one thing they do learn is that money can work wonders anywhere

The teaching process that schools are following is not good and they need to use the internet as a tool, not the source. The source is a student. Teachers need to explore the creativity in their student's minds. And then students can learn and solve problems using their own creativity and innovative thinking and not by the direct work of parents/ tuition. If necessary the parents can help with encouragement but they should not do the homework themselves. Completing the assignment given is not as important as the learning process that a child goes through while doing it. It is essential for parents to provide computer and internet facilities to their children. It is not that easy for parents to pick up modem technologies as fast as their children but it is very important that parents also know about the importance of computers literacy and internet education.

In government school especially in India, the level of computer and internet infrastructure is very low. I know government school or school in villages provide computer education only after 9th or 10th class. Within that little time too, a government school student barely gets to learn much because there are 5- 10 students who are assigned a single computer. It is very difficult to learn this way. I agree that this is the best time to teach them about the advanced computer skills but this is not the way to do it. The lack of Information technology infrastructure in schools is a big question mark against

Government policies towards computer education. It feels bad to see on the news that computer teachers are on strike again. This happens once a year. The government must think, how computer teachers can teach with low-quality IT infrastructure in government schools and a small salary?

2.6.6 Electronic Mail

Electronic mail is a method of exchanging messages via computer networks and the Internet; the addressee receives the message virtually instantly. Using e-mail requires creating mailbox with an e-mail service provider. The mailbox is protected with a username and password.

Advantages:

An e-mail message can be sent to many recipients at once;

A message can have one or several file attachments;

Users can access their e-mail account from any computer connected to the Internet;

No paper needed;

Very low direct and indirect costs;

Messages can be received on mobile devices.

Disadvantages:

The advantages of e-mail are also used by spammers and computer viruses;

Attached files can contain viruses.

2.7 Use of ICT to Simplifly Record Keeping: Information Management in Educational Administration in Special and Inclusive Setting

2.7.1 Role of ICT in record keeping and information management in school administration

ICT makes dynamic changes in society. It is influencing all aspects of life. The influences are felt more and more at schools. Because ICT provides both students and teachers with more opportunities in adapting learning, teaching and managing the individual needs, society is forcing schools to aptly respond to this innovation. It provides newer and more effective ways of mitigating some of the challenges being faced by the educational system of the country. These technologies distinguish themselves by their

rapid evolution and revolution, continuously changing the modes of engagement with them. A decade long infusion of computers, and more recently ICT, has demonstrated varying impacts on learning. In the current information age, educational institutions are expected to playa crucial role as the engine for knowledge generation and learning environment. In this regard ICT becomes the vital means to facilitate this task. ICT has become an essential part of our everyday life, accordingly this integration in school improvement is not only for the purpose of teaching and learning, but also for educational management use, it has become one of the most effective factors in the school improvement. ICT plays a vital role in improving the functional effectiveness of school system. ICT can help the school administrators to improve administrative tasks such as school record keeping system and school information management system.

2.7.2 Record Keeping

School records are books, documents, files and CD ROM in which is embodied information on what goes on in school (e.g. scholastic, co-scholastic, non-scholastic activities and important events etc), the school plant as well as other relevant information focusing on the growth and development of the school.

The school records are official transcripts or copies of proceedings of actions, events, other matters kept by the school administrator, school records could be viewed as authentic registers or instruments or documents of official accounts of transaction or occurrence which are preserved in the school's office.

Therefore, every school must keep certain specified records.

Importance of school records:

School records keeping includes the fact that school records tell the history of the school and are useful historical sources.

1. Tell the history of the school and are useful historical sources.
2. Facilitate continuity in the administration and management of a school.
3. Facilitate and enhance the provision of effective guidance and counselling services for students in the social, academic career domains.
4. Provide information about student's special educational or other needs, students current level of performance, students medical history etc.
5. Provide information needed on ex-students by higher and other related institutions and employers of labour for admission or placement.

6. Facilitate the supply of information to parents and guardians for the effective monitoring of the progress of their children/wards in schooling or performance.
7. Provide data needed for planning and decision making by school heads, ministries of education and related educational authorities.
8. Provide a basis for the objective assessment of the state of teaching and learning in a school, including staff and student performance by supervisors and inspectors.
9. Provide information for the school community, the general public employers as well as educational and social science researchers for the advancement of knowledge.
10. Enable school heads to collate information on pupils and staff for decision making by higher authorities, the law courts security agencies and other related government agencies when occasion demands.
11. Provide a mechanism such as the school timetable for the productive management of time and coordination of school work and activities.
12. Serve as data bank on which both the school head and staff and even students can draw on.

Some Important School Records

- Admission and Withdrawal Register: This is a permanent record book into which is entered information regarding the entry and exit, including the details of the education and progress of each pupil that ever passes through the school.
- Attendance Register: An attendance register is a book in which the presence or absence of students in a school is recorded on a daily basis. It is a statutory record that must be kept by every school. This record is kept on individual class basis. The class teacher is the custodian of this record.
- Log Book: The log book is a historical record of events that have significant effects on the schools' activities.
- The Visitors Book: The book is meant for recording the visits of important personalities, including officials and from the ministries of education or other related government agencies or any other school related visitors.
- Staff and Students' Personal Files: It is necessary that the school should have as much information on every teacher and student as possible without violating their privacy.

- Cumulative Record Folder: Students' cumulative record folder is a storehouse of information on students' cognitive, affective and psycho-motor development.
- Students' Report Sheet/Card'

1. It keeps data on students' academic performance.
2. It assists in monitoring students' academic progress.
3. It is a compliment to cumulative record folders.

- Lesson Notes/Plan

1. It gives information on what a teacher plans to teach the students at a period of time.
2. It clearly shows the teachers' level of preparedness and their level of competence.
3. It challenges teachers for the task ahead.

- Scheme and Record of Work Book: It reflects estimate of academic work which teachers expect to accomplish in each subject based on number of lessons they will have during each term. Pertinently it shows the ability of the teacher to organize the year's work and hislher resourcefulness and enthusiasm regarding the progress of the pupils.
- Staff Time Book and Movement Book

1. They provide information on when staff report and or close at work.
2. They promote regular attendance and punctuality
3. They help checking truancy and gross indiscipline in staff.

- Transfer and Leaving Certificate: Transfer and leaving certificate is the formal exit of the student after completion of study or leaving during the course of study in a school.
- Library records: The library will have many records like stock register, issue register etc. Many of the routine function of the library can be automated using library management software.
- Stock register: it is the record of all equipments and materials available in the school including the laboratories
- **Cash Register**

1. It is a record of fmancial transactions in schools.

2. It gives information about income and expenditures.
3. It promotes accountability and prevents corrupt practices.

- **Potential of ICT in Record Keeping**

The usefulness of keeping school records with Information and Communication Technologies (ICT) is for the following reasons:

- **Administrative Efficiency:**

One major setback in achieving the educational objective of the secondary education is inefficiency of the principal in keeping some records. With the introduction of information and communication technologies such as computers, digital libraries, e-mail, internet and so on where information are stored and disseminated, principals can do better in keeping records, and become effective and efficient in performing their prescribed roles as administrators.

- **Availability of Information:**

Information and Communication Technologies will help maintain adequate and accurate records in our schools and make it available with ease.

- **Easy Retrieval:**

It also leads to easy accessibility and dissemination of information on school records, will become available for national planning, financial budgeting, effective implementation of the educational programs and policies.

School record keeping is all about information collection, storage, retrieval, use, transmission, manipulation and dissemination for the purpose of enriching communication, decision-making and problem solving ability in the school system. It is therefore necessary that this process be as accurate and accessible as possible. Using ICT in keeping school records will help to facilitate and enhance the administration of the school towards achieving the goals of the secondary education.

2.7.3 Use of ICT in Information Management in Schools.

E-mail: Schools can create and send out a classroom newsletter to keep parents up to date bye-mail. They can collect the e-mail addresses in the beginning of the school year or give parents the opportunity to sign in for the newsletter on the school website. Individual teachers can send e-mails when there are problems in the classroom or for giving parents good news about the learning process of their children. E-mails can be sent individually or in group. It is very easy to make groups of addresses in the most

common e-mail programs. Parents can read and respond to e-mails whenever they have time. E-mails are also available in the LMS and students contributions in terms of chats and forum postings get e-mailed automatically by the system.

Website or Blog: On the school website all information of the school such as contact information, expectations, school rules, about the school and the teachers, how to use the internet at home, etc can be showed. The website can also have a calendar with useful information about school trips, parental evenings, and a map with pictures of activities with learners, etc. A school or class can make its own website on hired web space or can use free hosting web sites. Many schools are using free blogging services from Google and word press to provide information to parents, students and public in general.

Online Survey: Technology currently permits to get quick feedback from parents through online survey. Tools like Google form and survey monkey can be easily set up to get the information from parents and community members. These tools not only collect the information but perform the basic analysis and the outputs are provided automatically for quick decision making.

Virtual Learning Environments: A virtual learning environment (VLE) is a software system designed to support teaching and learning in an educational setting. A VLE will normally work over the Internet and provide a collection of tools such as those for assessment (particularly of types that can be marked automatically, such as multiple choice) or self-evaluation, communication through discussion boards, uploading of content, return of students' work, peer assessment, administration of student groups, collecting and organizing student grades, questionnaires, tracking tools, etc. New features in these systems include wikis, blogs, RSS and 3D virtual learning spaces. It can be seen that the VLE or the Leamer Management Systems (LMS) have its own inbuilt communication modules to interact with the learners which in turn can be monitored by parents at home. MOODLE is one of the popular open source LMS. You can review the features ofMOODLE from its website at www.moodle.org

Media Sharing: currently it is possible to share various kinds of media online. Most popular one is sharing of videos through online video sharing sites like You Tube. Schools can use this to communicate with parents by sharing school programme related videos, videos for training parents on child rearing practices, helping students manage stress, time etc. School related audio programme could be podcasted using online podcasting sites. Presentations by teachers and others could be shared with parents through slide sharing sites. Images can be shared using flicker.

Social Networks. It is possible to use social networks like Facebook, Twitter or MSN to communicate with parents. It is possible to make groups in Facebook and share information with the parents. Parents can communicate with each other of the class of their children. They can share pictures, important information, etc. Facebook is not so difficult to work with and a lot of parents already have a Facebook account. An interesting website to teach parents to use Facebook is http://facebookforparents.org/

Online Groups and Forums: Communicating with parents are made easy using forum and e-mail groups like Google groups and Yahoo groups. The school can create specific group of parents using Google or Yahoo services to communicate each other and among parents. It is also possible to share files among the group members.

SMS and Instant Messaging: School can send SMS to the parents when the child is not at school. So the parents will immediately know if their child is playing truant. When the school has to send an urgent message for parents, school can send a collective SMS, warn parents or an individual SMS to contact a specific parent. Now days instant messaging service like WhatsApp is very popular among teachers, students, and parents. The simplicity of this tool makes it easy for sending information to parents. Specific WhatsApp group could also be formed for taking up discussion on a specific issue.

2.8 Let us sum up

- The integration of computers and communications offer unprecedented opportunities to the education system with its capacity to integrate and interact with each other over a wide geographic distance in a meaningful way to achieve the instructional objectives.
- The development of new broadband communication services, convergence of telecommunication with computers, recent developments in the field of communication protocol have fostered numerous proposals for the uses of leT to support the teaching and learning environment. The growth of these communication and computer systems, their ease of use, the power and diversity of information transfer allow teachers and students to have access to a world beyond the classroom.
- ICT development in education is a continuum approach along which an educational system or institution can be mapped depending on the stages of ICT development. These broad stages have been termed as Emerging, Applying, Infusing and Transforming stages oflCT development.
- ICT stands for information and communication technology and is defined as a

"diverse set of technological tool and resources used to communicate, and to create, disseminate, store, and manage information."

- ICT encompasses both the internet-enabled sphere as well as the mobile one powered by wireless networks. It also includes antiquated technologies, such as landline telephones, radio and television broadcast - all of which are still widely used today alongside cutting-edge ICT pieces such as artificial intelligence and robotics.
- ICT commonly means more than its list of components. It also encompasses the application of all those various components. It's here that the real potential, power and danger of ICT can be found.
- The scope of ICT is not fixed, but is responsive to ongoing technological developments. This is evident in the emergence of advanced internet technology over the past few years and the resulting changes in the ways that students construct with others.
- Student develop capability in using ICT for tasks associated with information access and management, information creation and presentation, problem solving, decision making, communication, creative expression, and empirical reasoning. This includes conducting research, creating multimedia information products, analyzing data, designing solution to problems, controlling processes and devices, and supporting computation while working independently and in collaboration with others.

The scopes of ICT in various education sectors are:

13. Infonnation Technology in Educational Management
14. Lifelong Learning
15. Distance Learning
16. IT-Professional and Vocational Education in Information Technology
17. Advancing community linkages
18. lmproving policy planning and management
19. Establishing and sustaining lifelong learning
20. Facilitating skill formation
21. Lively teaching learning process.
22. Those students can find information, they need proper instructions, they need scope for creativity, and expectations of the teacher bring forth performance.

23. Helping the student learn.

24. Enhance teaching.

- ICT is leveraged for economic, societal and interpersonal transactions and interactions. ICT has drastically changed how people work, communicate, learn and live.
- Studies of teaching and learning in schools around the world identify four broad stages in the way the teachers and learners use ICT as a support to teaching and learning - supporting work performance, enhancing teaching, facilitating learning and creating innovative learning environments.
- Several attempts have been made to classify the functions of ICT in education in the literature, However, the most comprehensive and well defmed classification describes the following functions of the use of ICT in education: (a) ICT as Object (b) ICT as Assisting Tools (c) ICT as Management of Learning and (d) ICT as Medium of Teaching & Learning.
- An increasing body of evidence suggests positive results of the ICT integration with teaching and learning. The type, features, styles, usage and pedagogical base of these transformations from CAL to WBI has been described below.

Type: Computer Assisted Learning (CAL)

Features: Interactivity, Flexibility and Leamer Centered

Styles: Drill & Practice, Tutorials, Simulation and Instructional Games

Usage: Self Paced Instruction

Pedagogical Base: Primarily Behavioral Objectives

Type: Multimedia Based Instructional Software

Features: Interactivity & Multi model Instruction

Styles: Drill & Practice, Tutorials and Simulation & Modeling

Usage: Self-Paced Instruction

Pedagogical Base: Primarily Behavioral Objectives & Constructivism

Type: Web Based Instruction

Features: Interactivity, Just in time & On demand Instruction

Styles: Computer Supported Collaborative Learning Environment

Usage: Asynchronous & Synchronous Virtual Class Room

Pedagogical Base: Primarily Constructivism

- Learning and teaching whether it is through actual classroom settings or through technological applications utilizes many psychological principles knowingly or unknowingly. The most commonly used or heard Schools of Psychology are Behaviourism, Cognitivism and Constructivism.
- ICT is used in education for supporting students" learning or for development of competences, in other words for helping to reach the goals of education. The quality of learning depends on how ICT is used in learning.
- ICT could be used in education for supporting the development of students" motivation.
- There are many concepts that can be used to describe motivational aspects of teaching and learning.
- According to SDT, a student's way of thinking has an important role in the process of motivation.
- Based on the UNESCO publication, a model has been presented that can be useful in determining the stage of ICT development reached by a country, a district, or even an individual institution.
- Studies oflCT development in both developed and developing countries identify at least four broad approaches through which educational systems and individual institutions typically proceed in their adoption and use of I CT. Sometimes, the number of stages identified varies, though there is a general consensus that the introduction and use of ICT in education proceeds in broad stages that may be conceived as a continuum or series of steps. These steps, termed Emerging, Applying, Infusing, and Transforming.
- The potential of each technology varies according to how it is used. Haddad and Draxler identify at least five levels of technology use in education: presentation, demonstration, drill and practice, interaction, and collaboration.
- Each ofthe different ICTs-print, audio/video cassettes, radio and TV broadcasts, computers or the Internet-may be used for presentation and demonstration, the most basic of the five levels. Except for video technologies, drill and practice may likewise be performed using the whole range of technologies.
- Teleconferencing refers to "interactive electronic communication among people

located at two or more different places." There are four types of teleconferencing based on the nature and extent of interactivity and the sophistication of the technology:

- 1) Audio conferencing;
- 2) Audio-graphic conferencing,
- 3) Videoconferencing; and
- 4) Web-based conferencing.
- Online learning involving students logging in to formal courses online is perhaps the most commonly thought of application of the Internet in education.
- Radio and television have been used widely as educational tools since the 1920s and the 1950s, respectively.
- The Internet has introduced improvements in technology, communication and online entertainment, but it is also incredibly useful for education purposes as well.
- Electronic mail is a method of exchanging messages via computer networks and the Internet; the addressee receives the message virtually instantly.
- ICT has become an essential part of our everyday life, accordingly this integration in school improvement is not only for the purpose of teaching and learning, but also for educational management use, it has become one of the most effective factors in the school improvement.ICT plays a vital role in improving the functional effectiveness of school system. ICT can help the school administrators to improve administrative tasks such as school record keeping system and school information management system.

2.9 Check your progress

Define ICT

What are the components of an ICT system?

What are the scopes oflCT in various education sectors?

What are the use oflCT in education from the point of view oflearning?

Explain ICT in developing collaborative network.

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Unit - 3 ❐Use of Multimedia in Education

Structure

3.1 Introduction

There has been a rapid growth in recent years in the uses of digitaltechnologies in education, which mirrors the increasing importance of the useof these technologies in the world in general. In mainstream education inmany parts of the world, the uses of digital technologies have beenconstantly increasing and we find ourselves in situations in which all teachersare being expected to demonstrate their ability to use such technologies aspart of their teaching toolkit.

With the advancement of technology in this world, we can see that the world that we live in is changing rapidly and the field of education are one of the field that are growing to be much better. The old day education where the learning environments are passive is long gone. We can see that the use of multimedia in education has grown a lot in this recent years and is looking to expand ever further in the future.

The traditional education also knows as conventional education is a long-established customs found in school that society has traditionally deemed appropriate. This type of education is more to teacher-centered that focused on rote learning and memorization. In the traditional learning, students are passive absorbers of information and authority. They are less active in class and lack in problem solving skills. Furthermore, the traditional ways of learning are much more linear with factual accumulation and skill mastery while the new approach with the help of multimedia are non-linear, with one idea linked to another, allowing the learner to choose the path that they want to learn.

The traditional approach of learning also lack in resource. Knowledge can only be absorbed through lecture and textbook. By using multimedia, there will be much more resource that can be attained especially through the use of the internet. The traditional approach of learning is also less creative. The students are more passive as they lack in material resource needed in order to express their creativity. Such loop hole can make children to be less passionate to learn. This is why multimedia use in education is vital in education.

Multimedia is vital in our life. This is because it is packed with various elements such as text, graphic, sound, video and animation. All of this element can be seen in our surrounding. It is also used in various fields such as in education, training, business, games, science and technology. This is a proof that multimedia is important. In fact, multimedia is changing the ways of learning itself. Instead of just limiting with a linear presentation such as reading text from a book, multimedia makes many improvements in learning by bringing various elements in order to make it more dynamic.

"Multimedia is a synthesis: a hybrid offering the advantages of the user-driven book with the wonders of electronic technology" -Robert Winter.

A primary application of the interactive multimedia for instruction is in an instructional situation where the learner is given control so that he/she may review the material at his or her own pace and in keeping with his/her own individual interests, needs, and cognitive processes. The basic objective of interactive multimedia material is not so much to replace the teacher as to change the teacher's role entirely. As such, multimedia must be extremely well designed and sophisticated enough to mimic the best teacher, by combining in its design the various elements of the cognitive processes and the best quality of the technology. With today's multimedia courseware, once a programme has been designed and built in with the appropriate responses, it should be flexible and permit change and alteration.

Multimedia is a melody sung in harmony with multi-channel and multi-modal bits of knowledge and creation.

Multimedia facilitates mastering basic skills of a student by means of drill and practice. It helps in problem solving by means of learning by doing, understanding abstract concepts, provide enhanced access for teachers and students in remote locations, facilitate individualized and cooperative learning, helps in management and administration of classroom activities and learning content, and simulate real life problem handling environments. Multimedia Technology is used and experimented by various educational institutions of all levels all over the world in their own designed modes.

3.2 Objectives

After going through this unit you will be able to

- define multimedia and discuss its meaning, nature, scope and approach.
- explain the different types of projected and non-projected aids along with their merits and demerits.
- discuss about the different advantages and limitations of multimedia in education.
- discuss the recent trends in multimedia.
- Explain the implications of multimedia in teaching and learning.

3.3 Multimedia : Meaning, Nature, Scope, Definition and Approaches

Information which is stored in different forms could be combined and used in different combinations. Multimedia can be recorded and played, displayed, dynamic, interacted with or accessed by information processing devices, such as computerized and electronic devices Multimedia devices are electronic media devices used to store and experience multimedia content. This process has given rise to the term 'Multi-media'. This combination of different media for communication has influenced and changed all aspects of our life, including the teacher and the learner. Multimedia has become an inevitable part of any presentation. We have seen that it has found a variety of applications right from entertainment to education. The evolution of internet has also increased the demand for multimedia content. Multimedia is a term used to describe how multiple means of media like text, audio, graphics, animation, video, and interactivity are used to communicate information. It is also often used to describe any computer media. This helps us to understand information at a faster rate.

3.3.1 Meaning of Multimedia

Multimedia is defined in many ways. Most of the definitions agree on the characteristic that multimedia contains texts, graphics, animations, video and sound in an unified way and the content can be structured and presented differently. Let us explore some of the definitions given below.

"Multimedia is the exciting combination of computer hardware and software that allows you to integrate video, animation, audio, graphics, and text resources to develop effective presentations on an affordable desktop computer" (Fenrich, 1997).

"Multimedia is characterized by the presence of text, pictures, sound, animation and video; some or all of which are organized into some coherent program" (Phillips, 1997).

From these definitions we see that Multimedia is a concept which sees the use of text, graphic art, sound, animation, and video in different combinations. This integration of Media into one whole and that which gives the user more benefits than any one of the media used individually is Multimedia.

Interactive Multimedia: The Encyclopedia Britannica Online defines "Interactive Multimedia" as, any computer-delivered electronic system that allows the user to control, combine, and manipulate different types of media, such as text, sound, video, computer graphics, and animation. Interactive multimedia integrates computer, memory storage, digital (binary) data, telephone, television, and other information technologies. Their most common applications include training programs, video games, electronic encyclopedias, and travel guides. Interactive multimedia shift the user's role from observer to participant and are considered the next generation of electronic information systems.

Multimedia learning as learning from words and pictures (Mayer 2005),

- The words can be printed (e.g., on-screen text) or spoken (e.g., narration).
- The pictures can be static (e.g., illustrations, graphs, charts, photos, or maps) or dynamic (e.g., animation, video, or interactive illustrations).

Multimedia instruction is intended to foster learning by presenting words and pictures.

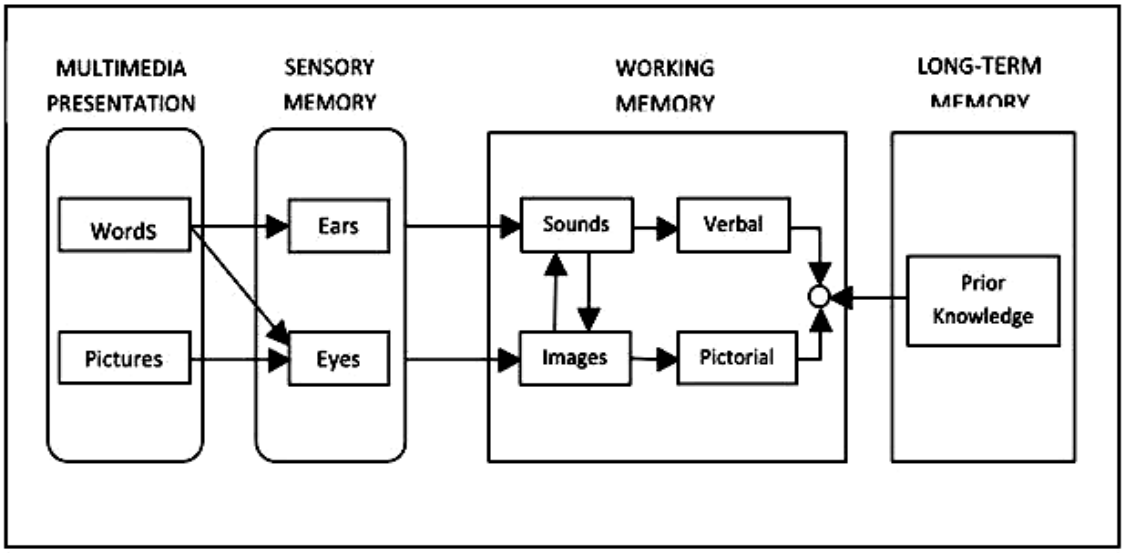


Figure : Visual Representation of the Cognitive Theory of Multimedia Learning (sources: http://www.ied.edu.hk/apfslt/v12_issue2/rias/image1.jpg)

3.3.2 Basic Assumptions and Principles

Richard E. Mayer discusses twelve principles that shape the design and organization of multimedia presentations. Some examples are included:

Coherence Principle - People learn better when extraneous words, pictures and sounds are excluded rather than included.

Signaling Principle - People learn better when cues that highlight the organization of the essential material are added.

Spatial Contiguity Principle - People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.

Segmenting Principle - People learn better from a multimedia lesson is presented in user-paced segments rather than as a continuous unit.

Pre-training Principle - People learn better from a multimedia lesson when they know the names and characteristics of the main concepts.

Modality Principle - People learn better from graphics and narrations than from animation and on-screen text.

Multimedia Principle - People learn better from words and pictures than from words alone.

Personalization Principle - People learn better from multimedia lessons when words are in conversational style rather than formal style

3.3.3 Definitions and Meaning of Multimedia

Multimedia is a burning topic in education because it represents the latest technology and introduces into the classroom whole new ways of thinking about curriculum, interactions with students and even the nature of learning itself. He elaborates that the meaning of multimedia has changed from meaning nothing to everything.

Multimedia can mean any kind of file or document, either a text or spreadsheet that have audio or video effects or "an interactive information cafe". Whatever it is not, it certainly is the most promising technology in education. - WeidongXhang (2003)

Packiam (1986) had referred to the use of appropriate and carefully selected varieties of learning experiences which when presented to the learner through selected teaching strategies will reinforce and strengthen one another in such a way that the learner will achieve predetermined objectives in an effective way.

Education is defined as a means of providing systematic training and instruction and training is provided by instruction, discipline on drill. In terms of having training and instruction, Multimedia is a powerful tool which can provide individual and interactive instructions as well as motivation for practice in an entertainment environment. Multimedia also provides students with different learning styles, the opportunity to learn, share, communicate and grow using all their faculties.

3.3.4 Nature of Multimedia

Multi - Many

Media - Techniques /methods.

Multimedia approach uses a number of media, devices, techniques, in the teaching learning process. Multimedia approach has come out of researches and experiments in educational technology that have been undertaken in order to improve the process of teaching learning. Multimedia approach aims at providing meaningful learning experiences via a mix of media in order to achieve predetermined objectives. The choice of the media has to be done carefully so that one does not hamper or reduce the effect of the other i.e. each media must complement the after. The media have to be used sequentially and judiciously. Only necessary ones are to be used. Then it would be possible to make optimum use of them in a most economical manner. In multimedia approach, several media and techniques are used as powerful means of communication.

- Multimedia approach uses a number of media, devices, techniques in the teaching learning process.
- Multimedia approach can convey vast information and provide many sources from which student can access the information.
- Multimedia approach will improve the teaching learning process.
- Multimedia approach is not restricted to a single type of learning style. It can provide the support of a wide range of activities.
- Multimedia approach aims at providing meaningful learning experience via a mix of media in order to achieve predetermined objectives.
- Multimedia approach provides the opportunity to gain mastery of competencies and skills.
- The choice of the media has to be done carefully so that one does not hamper or reduce the effect of the other. That is each media must complement the other.

- Multimedia approach will enable the learner to get access to information in dynamic environment.

3.3.5 Educational Implications of Multimedia

- Multimedia enables students to represent information using several different media. Hypermedia links allow students to organize information in meaningful ways.
- Multimedia can take into account different learning styles. Some students learn by interpreting text, while others require more graphical or aural representations.
- Multimedia allows for self-pacing and discovery, students can take the time they need and choose the path of learning making learning meaningful and pleasurable.
- Multimedia helps in development of higher order thinking skills. Interactive multimedia encourages student.
- Multimedia provided the students the flexibility of anywhere, 'any time' learning.
- Multimedia helps in developing group and interpersonal skills. Better communication between students via e-mail, chat sessions etc., can encourage collaborative learning and enhance student-teacher interaction.
- Multimedia helps students to learn the content in a given discipline. It helps students to think effectively, practice problem solving and decision making.

3.3.6 Why Use Multimedia in the Classroom?

Multimedia activities encourage students to work in groups, express their knowledge in multiple ways, solve problems, revise their own work, and construct knowledge. The advantages of integrating multimedia in the classroom are many. Through participation in multimedia activities, students can learn:

- Real-world skills related to technology
- The value of teamwork
- Effective collaboration techniques
- The impact and importance of different media
- The challenges of communicating to different audiences
- How to present information in compelling ways
- Techniques for synthesizing and analyzing complex content
- The importance of research, planning, and organization skills

- The significance of presentation and speaking skills
- How to accept and provide constructive feedback
- How to express their ideas creatively
- There are, however, some constraints to using multimedia in the classroom, including:
- Technological resources, both hardware and software
- Technological skills, for both the students and teacher
- Time required to plan, design, develop, and evaluate multimedia activities

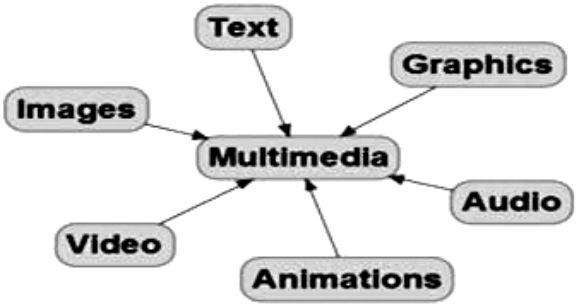
3.3.7 Role of Teacher in Multimedia Approach

- Teacher has to adopt a number of methods and techniques.
- Teacher has to aware of the different available media and their availability.
- Teacher should be physically competent to use and demonstrate the use of the different media.
- Teacher should be skillful enough to make a judicious choice of media and competent enough to mix them sequentially and in an orderly manner.
- Teacher's role is that of a facilitator or manager of activities.
- Teacher has to lead his student for independent, individualized learning.
- Prerequisites for developing a Multimedia Instructional device

3.3.8 Elements of Multimedia

The different building blocks of Multimedia are Text, Images and graphics, Audio, Video, and Animation. Any multimedia application consists any or all of them. Let us learn about each one of them

- Text - ASCII/Unicode, HTML, Postscript, PDF
- Audio - Sound, music, speech, structured audio (e.g. MIDI)
- Still Image - Facsimile, photo, scanned image, photographs, drawings, maps and slides
- Video (Moving Images) - Movie, a sequence of pictures
- Graphics - Computer produced image
- Animation - A sequence of graphics images



1. **Text:** Text and symbols are very important for communication in any medium. Using text in online training has many advantages: text files are small so they perform well at low bandwidth, the user can search for specific words or phrases, and text can be easily updated. You can create text directly within an authoring application or import it from external text files. Anti-aliasing enables you to create attractive text that blends into the background color without any jagged edges. Authorware, Director, and Flash all support anti-aliased text. Using anti-aliased text helps avoid having to create display text as a graphics file, which would make your overall course size much larger than if you simply entered text directly into the authoring tool.
2. **Images and Graphics:** Images play a very important role in a multimedia. It is expressed in the form of still picture, painting or a photograph taken through a digital camera. The points at which an image is sampled are known as picture elements, commonly abbreviated as pixels. The pixel values of intensity images are called grayscale levels. There are different kinds of image formats like the Captured Image Format and the format when images are stored. The captured image Format is known by two main factors that is spatial resolution which is specified as pixels x pixels (eg. 640x480) and color encoding, which is specified by bits per pixel. Both factors depend on hardware and software for input/output of images. The Stored Image Format is when we store an image; we are storing a two-dimensional array of values, in which each value represents the data associated with a pixel in the image. These images can be edited with the help of few of the software like general drawing programs, JASC Paint Shop Pro, Corel Photo Paint, Macromedia Fireworks ,Art Rage: free (NZ) paint program simulating, Corel Draw, and Open Office / Libre Office Draw, GIMP, and Mypaint.

Graphics Formats: Most Web browsers can display GIF and JPEG graphics files. Web browsers that are version 4.0 or later can use the JPEG format for continuous-tone images, such as photographs and images that use color gradients. The PNG format was

developed as a patent-free replacement for the GIF format. PNGs can use an alpha channel to define transparency in a graphic. Import PNG files into any of the Macromedia tools as an alternative to GIF files, especially if you need 24-bit graphics or graphics with transparency. Use this format in Web-native content only when delivering to newer browsers; some older browsers do not support the PNG format also display PNG graphics files. The two most popular graphic formats for online training and Web pages in general are GIFs and JPEGs. Both are bitmap files that are relatively small in size. The two formats compress images differently, each excelling at compressing different types of graphics. Using software such as Macromedia Fireworks, you can compare the file size of your graphics with various optimization settings to help you pick the best file format. Use the GIF format for line art and graphics that have large areas of a single color. Graphics saved in the GIF format can have one transparent color where JPEG graphics cannot. There are applications like format factory which helps us in converting graphics from one format to other.

3. **Audio:** Audio can enhance learning concepts and reinforce ideas presented as text or graphics on the screen. Using audio may be essential to the teaching of topics such as a foreign language or music appreciation. There are three types of audio assets that are commonly used in e-learning:

- Music
- Narration (voice-overs)
- Sound effects

Music demands a higher-quality and a wider sound-frequency range than narration and therefore produces larger files. Narrations generally have a smaller sound frequency range so it can be compressed more than music and still retain good sound quality. Sound effects are generally short so they don't have a large impact on the overall file size of an online course.

Audio Formats: The WAV and AIFF audio formats, popular on Microsoft Windows and Macintosh systems respectively, usually create files that are too large to use in an online course. Use one of the compressed formats with the goal of balancing small file size with acceptable quality audio. You have different options depending upon which authoring software you use. Both Shockwave Audio (SWA) used by Authorware and Director, and MP3, which is used by Flash are popular compressed formats useful for all three types of audio used in e-learning. The open source audio editing software like

audacity is very popular tool for audio editing.

4. Video: Although video requires lots of bandwidth to download, it is very useful for conveying certain information. Using video in e-learning helps realistically demonstrate equipment and processes among other things. For instance, an e-learning course in botany might show a video of a sprouting seed. A course about the features of an airplane might show a video of a crewmember properly closing and securing a door for takeoff. The intricate level of detail visible in video is also ideal for illustrating subtle, nonverbal information. For example, to teach sales skills you could use a video to demonstrate an interaction between a salesperson and a customer, then have the learners analyze the body language of the people involved in the transaction.

Video Formats: There are three standard digital video formats: Quick Time, Video for Windows, and MPEG. Video files tend to be large so they really aren't appropriate for delivery on modem connections. You may choose to include video in your e-learning course if you are delivering it over an intranet or to users with relatively high bandwidth connections. There are many open source video editing tool and open shot is one such popular tool.

5. Animation: Animation illustrates concepts with movement, shows processes, or draws attention to a region or elements of a screen. Since animations usually involve graphics, they are highly dependent upon the size and file type of the graphics that are being animated.

Animation Formats: There are many ways you can create animations. Authorware, Dreamweaver, Director and Flash can all create animations. An animation created within an authoring program is usually smaller and more efficient than an animation created in another tool and then imported in your authoring program. This is particularly true when an animation is based on shapes created with the software's drawing tools rather than with imported bitmaps. For example, Flash excels at creating vector graphics and animations. Although Flash can animate bitmap graphics, animations made predominately with vector graphics in Flash are considerably smaller than animations created with bitmap graphics. Simple 2D animations can be created using open source tools like pencil and more advance tools like blender.

3.3.9 Types of Multimedia

Multimedia may be broadly divided into Linear and Non-linear Multimedia.

In Linear Multimedia the active content progresses without any navigational control

for the viewer. The viewer interacts with the multimedia application in which the content is sequentially arranged. The viewer does not control the progress of the content. In other words, the viewer is a passive receiver of the multimedia content most of the time. For example a movie uses a combination of audio, graphics and animations, but the viewer has no control over the sequence of events.

Non-linear Multimedia uses interactivity to control progress as with a video game or self-paced computer based training. It allows one to use the content according to ones wants. It is a two way communication. This communication can be controlled by using buttons, links and hypertext. Hypermedia is an example of non-linear content. It connects to different media elements such as audio and video. Multimedia presentations which are live or recorded are also Non-linear. A recorded presentation may allow interactivity via a navigation system. A live multimedia presentation may allow interactivity via an interaction with the presenter or performer.

3.4 Types of Instructional Aids: Projected and Non-projected Aids, Projector, Radio, Tape Recorder, Television, Films, Computer, White Board, Smart Board, E-Flash, Cards, Educational Toys

3.4.1 Instructional Aids

The word instructional aid refers to any material or device used to assist the instructor in:

Preparation of the lesson(s)

Presentation (teaching) of the lesson(s)

Facilitates trainees' learning

3.4.2 Importance of Instructional Aids

Instructional aids assist to reinforce and supplement the instructor's communication during the presentation of the lesson. This is done by:

- clarifying the concept or idea

- making the communication channel more explicit

- helping the learners to develop a good conceptual understanding of the content or skill taught. For example an idea which would be difficult (abstract) can easily be simplified when an instructional aid is used to present it. Therefore learners are able to relate an idea to their common reality or environment with the use of aids.

3.4.3 Types of instructional aids

There are many types of instructional aids. Each instructional aid, however, may have inherent advantages and disadvantages (or limitations). Essentially types of instructional aids are determined by:

The instructor/teacher. The instructor's ability either to create (improvise) and use aids or select from the readily made and suitably available aids is crucial. This squarely depends on the instructor's prowess, ability or experience.

Objective of the lesson. By virtue of the objective(s) of a lesson, the use of certain instructional aids may be more desirable or otherwise. For example if a lesson involves the demonstration of a particular skill, then the use of demonstrational aids becomes inevitable.

Nature of subject matter. The subject matter or content to be taught will underline the type of aids (if any) to be used. For example, if the material is considered comparatively difficult or abstract, then instructional aids have to be carefully selected and used.

Generally, instructional aids can be grouped in four main categories:

(a) Visual aids

These appeal to sight. They include the blackboard, posters, charts, displays, models, pictures etc.

(b) Auditory aids

These type of instructional aids appeal to learners sense of hearing. They include radio and many types of audio recording.

(c) Audio-Visual Aids

Audio Visual aids appeal to both hearing and seeing. They include sound motion pictures, slides on sound and television.

(d) Stimulation devices

These are the actual representation of the real objects or process, but reduced in size. They include devices built to stimulate the action or function of the real device. Their purpose is to develop the 'feel' of the actual functioning of the real objects.

3.4.4 Characteristics of good instructional aids

Instructional aids are essential to effective instruction. The instructor should know

how to prepare and use instructional aids and should recognize their value in fostering good instruction. The greatest value of instructional aids lies in:

- Their appeal to trainees senses and perceptions
- Their ability to attract and hold trainees attention and interest.
- The ability in developing understanding of the material to be learned
- Helps the trainees to learn faster and save instructional time
- Helps trainees to understand the relationships between different concepts or ideas.

A good instructional aid should promote certain desirable results. It should stimulate interest, command attention, be easily understood and promote a positive reaction on the part of the trainee. An instructional aid should be complete, have some explanation in the form of a label, and finally be as simple as possible.

3.4.5 Objectives of Instructional Aids

1. To enhance teachers skills which help to make teaching-learning process effective
2. Make learners active in the classroom
3. Communicate them according to their capabilities
4. Develop lesson plan and build interest
5. To make students good observer
6. Develop easy and understandable learning material
7. Follow child cornered learning process
8. Involve intimation in objectives
9. To create interest in different groups
10. To make teaching process more effective

3.4.6 Advantages of Instructional aids

1. Its helps to make learning process more effective and conceptual.
2. Its helps to grab the attention of students
3. It builds interest and motivation teaching students learning process
4. It enhance the energy level of teaching and students
5. It is even better for over burden classrooms
6. It provides students a realistic approach and experience

3.4.7 Limitations in Instructional aids

1. Technical Problems
2. Students Distractions
3. Expensive
4. Time consuming
5. Need Space
6. Convenience

3.4.8 Audio Visual Aids

Audio visual material must be seen in their relationship to teaching as a whole and to the learning process as a whole, until the teacher understands the relationship between audio visual material and teaching learning process.

Audio visual materials are produced, distributed and used as planned components of educational programs. It helps the process of learning that is motivation, classification and stimulation. A.V. aids are multisensory materials which motivate and stimulate the individual. It makes dynamic learning experience more concrete realistic and clarity. It provides significant gains in thinking and reasoning.

Audio visual aids are sensitive tools used in teaching and as avenues for learning. These are planned educational materials that appeal to the senses of the people and quicken learning facilities for clear understanding.

Definitions:

1. According to Kinder S. James: Audio visual aids are any device which can be used to make the learning experience more concrete, more realistic and more dynamic.
2. According to Burton: audio visual aids are those sensory objects or images which initiate or stimulate and reinforce learning.
3. According to Carter.V.Good: audio visual aids are those aids which help in completing the triangular process of learning that is motivation, classification and stimulation.
4. According to good's dictionary of education: audio visual aids are anything by means of which learning process may be encouraged or carried on through the sense of hearing or sense of sight.
5. According to Edger Dale: audio visual aids are those devices by the use of which communication of ideas between persons and groups in various teaching and

training situations is helped. These are also termed as multi-sensory materials.

6. According to McKean and Roberts: audio visual aids are supplementary devices by which the teacher, through the utilization of more than one sensory channel is able to clarify, establish and correlate concepts, interpretations and appreciations.
7. According to KP. Neeraja: an audio visual aid is an instructional device in which the message can be heard as well as seen.

Purpose of A-V aids:

- To supplement and enrich teachers own teaching to make teaching-learning more concrete.
- To serve an instructional role in itself.
- To create interest among the group.
- To make teaching as an effective process.

Advantages of AV aids:

1. A.V.Aids helps in effective perceptual and conceptual learning.
2. A.V.Aids helpful in capturing and sustaining attention of students.
3. A.V.Aids arouses interest and motivates students to learn.
4. A.V.Aids is helpful in new learning.
5. A.V.Aids helps in saving energy and time of both the teachers and students.
6. A.V.Aids provides near realistic experience.
7. A.V.Aids can meet individual demands.
8. A.V.Aids is useful in for education of masses.

3.4.9 Classification of A.V. Aids:

Various classifications are given for Audio visual aids according to the type of projection by various authors.

A) Classification of A.V.Aids

I) Audio aids

Audio materials are those which can be heard. Ex: - radio, tape recorder, walkman, Headphones.

II) Visual aids: these are helpful to visualize the things. Ex: - graphic aids, 3d-aids, display boards, and print material.

III) Audio visual aids: these aids can be heard and seen simultaneously. Ex: - projected aids, TV, films.

B) Classification of A.V.Aids

I) Simple A.V.Aids: It includes graphic aids, display boards, 3d-aids, print material...etc.

II) Sophisticated A.V.Aids: includes audio-visual aids.

3.4.10 Principles to be Followed for the Effective Use of A.V. Aids:

Audio visual materials should function as an integral part of the educational program.

A.V. aids should be centralized, under specialized direction and leadership in educational programs.

An advisory committee consisting of representative from all areas of curriculum should be appointed to assist in selection and coordination of A.V. materials.

An education program should be flexible.

A.V. material should be carefully located to eliminate duplication, easy accessibility and convenient use.

A.V. material should be available whenever and wherever they needed for effective utilization as an integral part of curriculum

Budget appropriations should be made regularly for A.V. education programs.

Periodic evaluation to be done to assess the function of, utilization and expenditure of the program.

3.4.11 Projected Audio Visual Aids:

OVER HEAD PROJECTOR:

The over head projector is the most used in all a.v. aids. It projects transparencies with brilliant screen images suitable for use in a lighted room. The teacher can write or draw diagrams on the transparency while he teaches; these are projected simultaneously on the screen by the OHP.

During presentation:

Keep the screen above the heads of the participants.

Keep the screen in full view of participants

Make sure you are not blocking any ones view when presenting.

Darken the room appropriately by blocking out sunshine and dimming nearby.

Turn the screen off between slides if you are going to talk for more than two.

Talk to the audience, not to the screen

Purposes:

To develop concepts and sequences in a subject matter area.

To make marginal notes on the transparencies for the use of the teacher that can carry without exposing them to the class.

To test students performances, while other classmates observe.

To show relationships by means of transparent overlays in contrasting color.

To give the illusion of motion in the transparency.

Advantages:

It permits the teacher to stand in front of the class while using the projector, thus enabling her to point out features appearing on the screen by pointing to the materials at the projector it self and at the same time, to observe the students reactions to her discussion.

Gains attention of the student

OVER HEAD TRANSPERENCIES:

Transparencies are popular instructional medium. They are simple to prepare and easy to prepare and easy to operate with the overhead projector which is light weight.

A 10*10 inches sheet with printed, written or drawn material is placed on the platform of the projector and a large image is projected on a screen behind you.

The projector is used from near to the front of the room with the teacher standing or sitting beside, facing the student.

Guidelines for making effective transparencies:

- Have one main idea an each transparency.
- Include only related figures and diagrams.
- Use simple lettering style in writing.
- Use diagrams in proposition to its lettering.
- Keep the message clear and simple.

- Emphasize the key messages.
- Use color and lettering with discretion.

Advantages:

- Permits face to face interaction with the students.
- Can be used in daylight conditions.
- Can present information in systemic developmental sequences.
- Requires limited planning and can be prepared in variety of inexpensive methods.
- Easily available.

THE OPAQUE PROJECTOR

Opaque projector is the only projector on which you can project a variety of materials ex: - book pages, objects, coins, postcards, or any other similar flat material that is non-transparent The opaque projector will project and simultaneously enlarge, directly from the originals, printed matter, all kinds of written or pictorial matter in any sequence derived by the teacher. It requires a dark room, as projector is large and not reality movables.

Advantages:

- Stimulates attention and arouses interest.
- Can project a wide range of materials like stamps, coins, specimen, when one copy is available.
- Can be used for enlarging drawings, pictures and maps.
- Does not require any written or typed materials, hand-written material can be used.
- Helps students to retain knowledge for longer period.
- Review instructional problems.
- Test knowledge and ability.
- Simple operation.

Disadvantages:

- Costly equipment.
- Needs to use it with care.
- Needs a dark room for projection

SLIDE PROJECTOR

A slide is a small piece of transparent material on which a single pictorial image or scene or graphic image has been photographed or reproduced otherwise.

Slides are a form of projected media that are easy to prepare. They are still pictures on positive film which you can process and mount individually yourself or send to a film laboratory. The standard size of the slides is 2 "X 2 "any 35mm camera will make satisfactory slides.

Types of slides

1. Photographic slides: 2" X 2"

   3" X 4"

a) Black and white

b) Colored

2. Handmade slides: can be made with

a) Acetate sheet

b) Cellophane

c) Etched glass

d) Plain glass

e) Lumarith

Slides can be made from photographs and pictures by teachers and pupils taking photographs and snapshots when they go on fieldtrips for historical, geographical, literacy or scientific excursions.

The arrangement of slides in proper sequence, according to the topic discussed, is an important aspect of teaching with them.

Advantages:

1. Requires only filming, processing and mounting by self or laboratory.
2. Results in colorful, realistic, reproduction original subject.
3. Preparation with any 35mm camera for most uses.
4. Easy to revise and up-date.
5. Easily handled, stored and re-arranged for various uses.
6. Can be combined with tape narration or can control time for discussion.

7. May be adapted to group or individual use

FILMSTRIPS

Film strips are sequence of transparent still pictures with individual frames on 35mm film. A tap recorded narration can be synchronized with film strip.

Each strip contains from 12 to 18 or more pictures. It is a fixed sequence of related stills on a roll of 35mm film or 8mm film.

PRINCIPLES

1. Preview filmstrips before using them and selected carefully to meet the needs of the topic to be taught.
2. Show again any part of the filmstrip needing more specific study.
3. Use filmstrip to stimulate emotions, build attitudes and to point up problems.
4. It should be introduced appropriately and its relationship to the topic of the study brought out.
5. Use a pointer to direct attention, to specific details on the screen.

TYPES OF FILMSTRIP:

1) Discussion filmstrip: it is continuous strip of film consisting of individual frames arranged in sequence usually with explanatory titles.
2) Sound slide film: it is similar to filmstrip but instead of explanatory titles or spoken discussion recorded explanation is audible, which is synchronized with the pictures.

ADVANTAGES OF FILM STRIPS:

1) Are compact, easily handled and always in proper sequence.
2) Can be supplemented with recordings.
3) Are inexpensive when quantity reproduction is required.
4) Are useful for group or individual study at projection rate are controlled by instructor or user.
5) Are projected with simple light weight equipment.

RADIO

Radio is a device with which the whole mass can be contacted at a time, efficiently and economically. Now-a-days, which increase in rural electrification, the number of radio sets in India is increasing greatly. Moreover, people are purchasing battery sets

and they have realized that it is a good thing to have one in the house. Radio sets have been provided in the common meeting places by the C.D. Organization. Radio is a good source of communication of idea. It gives news-bulletins, special programmes for rural people, housewives and children. It is a good source of disseminating information for health workers, farmers etc. In case of audio-aids, the message has to be simple so that the people can understand and act. The broadcaster has to get and hold the attention of the audience, otherwise the message is lost.

The All India Radio stations publish a Journal `Akashvani' which gives the meters and frequency in Kilo cycles on medium and short waves. The radio receiving set receives only one selected programme at a time, and conveys the same through its speaker. The station is selected by a tuner of the receiving set, which tunes the set to the frequency of the station. The movement of the tuner over the dial of the radio set is controlled by a knob. The entire broadcast frequency of the tuner is divided into a number of bands, each band including a small range of frequencies or wave-lengths. A band selector switch or knob is incorporated in the Cabinet of the radio. There is also an on and off switch and volume control are incorporated in a single knob. A radio can be operated by dry battery wet battery or electricity. For rural areas with no electricity, dry battery sets are generally used.

Uses of Radio

Radio is a popular, pleasing and a fast medium. However, it cannot be used to convey heavy, detailed knowledge. It uses are for:

* Announcements-meetings, demonstrations etc.
* Intimation or information- regarding availability of material, prices, places etc.
* Warnings-relating to weather, outbreaks of diseases.
* News reviews-about farmers etc.
* Interviews.
* Questions & Answers.
* Short talks.
* Play, skits, etc.
* Features and Documentaries.

Advantages of utilizing Radio

i) In-expensiveness - Radio instructions costs 1/5 or 1/6 that of T.V. instructions,

hence this is quite a suitable audio aid for reaching the masses, especially in the interior of villages, where means of communication and facilities are very few.

ii) Easy availability - There has been a lot of production of radio sets, with the result that their cost has been considerably reduced and therefore, radio is available these days with almost all families, even in the rural areas.

iii) A radio leaps barrier of time and space - A historical event can be reproduction on a radio set as well as a live broadcast can be transmitted from one corner of the world to another.

iv) Upto-date and Immediate - All the latest data as well as the current information can be transmitted and that too immediately.

v) Emotional Impact - A radio can bring a dramatic feeling in the group. It has the warmth of a drama, can create personal feeling of actor's presence and inspite emotions.

vi) Can bring realism - Voices of various experts can be brought right into the classroom.

vii) It can reach more people more quickly than any other means of communication.

viii) It can reach illiterates also.

ix) It inspires to form some action.

x) It is portable.

Disadvantages

i) It is a one way communication and audience reaction is not known.

ii) It requires concentrated attention of the listeners as only aural sense is used.

iii) Time-the learners have to adjust their time to the particular programme timing.

iv) Prerehearsing is not possible.

v) Radio set should be in a working condition.

vi) Frequently loses out in competition with entertainment.

TAPE RECORDERS

Tape recorders have become very common now-a-days and their use in education is gradually increasing. Tape recording, especially cassette tape recordings may be

prepared for group or individual learning.

Advantages

* Pre-rehearsing is possible.
* Information can be stored & used repeatedly.
* No problem of time.
* Communicator can present programme made by him.
* It can facilitate editing also, i.e. shortening, eliminating or adding of materials from different sources.

Disadvantages

* Many or may not be up-to-date.
* More expensive.
* One way communication.

Features to look for in a tape-recorder

i) Simplicity: It should be easy to operate.

ii) Portable: The recording equipment should be as light as possible.

iii) Cost: the amount of money available should be carefully considered before buying the equipment. However, expensive equipment generally is durable and as a result is may prove cheaper in the long run.

iv) Speed: The higher the speed used, the better will be the quality.

v) Size of the Tape Reels: Different machine will use different sizes.

vi) Frequency Range: In fact one of the two important points to be considered in making the selection is sound frequency range of the equipment and the programmes you plan to record. For high fidelity recording, the frequency range of the equipment should be similar to the frequency range of the sounds in the programme.

TELEVISION

Michael J. Apter says, "Television is the most powerful medium of mass communication which has ever existed and it has revolutionized our lives in many ways." Television is already being used to spread health and nutrition messages.

Television shows the actual picture, figure or diagram, along with the hearing sound. So, it has an advantage over radio, where the audience is only listening. The movements of the pictures hold the attention of the audience. Most of the homes in cities have a T.V. set. Now-a-days with increase in electrification, they are available in villages also.

Uses of Television

Radio is a popular, pleasing and fast medium. However, it cannot to be used convey heavy, detailed knowledge. Its uses are for:-

* Announcements - meetings, demonstrations etc.;
* Intimation or information - regarding availability of materials, prices, places, etc.;
* Warnings - relating to weather, outbreaks of diseases;
* News reviews - about farmers etc.;
* Interviews;
* Questions & Answers;
* Short talks;
* Plays, skits, ballads etc.;
* Features and Documents.

Advantages

i) T.V. can be used to broaden and enrich the experience of the audience.

ii) It can create a genuine interest in a subject or topic which then gives the teacher something on which he can build. For example one can really see the result of malnutrition due to lack of food etc.

iii) If a scientific experiment is mentioned, then it can be shown.

iv) T.V., if it is not used for a disproportionate amount of time, provides a welcome element of variety from the normal routine of group teaching etc.

v) It overcomes the barrier of time and space and to some extent of the language due to its visual effects.

Evaluating the T.V.Programme

Edger Dale suggests a simple method evaluating education television programmes by the following questions:

i) Whether the purpose of the presentation made clear to both audience and teacher?

Did the audience have something to watch for?

ii) Was the audience prepared for the telecast by reading etc?

iii) Did the audience understand the material?

iv) Did the receiver/audience find the presentation interesting?

v) Was the programme well organized?

vi) Was opportunity given to become involved, to participate?

vii) Were the key points emphasized by means of repetition and review?

viii) Did the telecast add certain experiences not easily available in the usual classroom situation or day-to-day life?

3.4.12 Non-Projected Aids

CHALK BOARD

DEFINITION

A chalkboard or blackboard is a reusable writing surface on which text or drawings are made with chalk or other erasable markers.Blackboards were originally made of smooth, thin sheets of black or dark grey slate stone. Modern versions are often green or brown and are thus sometimes called a green board or brown board instead.

A blackboard can simply be a piece of board painted withmatte dark paint (usually black or dark green). A more modern variation consists of a coiled sheet of plastic drawn across two parallel rollers, which can be scrolled to create additional writing space while saving what has been written. The highest grade chalkboards are made of rougher version porcelain enameled steel (black, green, blue or sometimes other colours). Porcelain is very hard wearing and chalkboards made of porcelain usually last 10-20 years in intensive use.

Blackboards have disadvantages:

- They produce a fair amount of dust, depending on the quality of chalk used.
- Some people find this uncomfortable or may be allergic to it, and there has been speculation about links between chalk dust and respiratory problems.
- The dust also precludes the use of chalk in areas shared with dust-sensitive equipment such as computers. However, these alternative methods of displaying information have drawbacks of their own.

- The scratching of fingernails on a blackboard is a sound that is well-known for being extremely irritating.

Blackboards are also used in many establishments (typically public houses) as a form of advertising often for upcoming events and menus - as well as to keep the score in darts matches.

FLANNEL BOARD

Sometimes called a flannel graph.

This teaching tool is called by different names:

Visual Board, Frick Board, Slap Board, Felt Board, Coherograph, Video graph

Flannelgraph is a storytelling system that uses a board covered with flannelfabric, usually resting on an easel. It is very similar to Fuzzy felt, although its primary use is as a storytelling medium, rather than as a toy

How to use

The principle involved is the inter1ooking of fibers of two rough or bairy surfaces, so that the pieces pressed on to a background which is hard and vertical will stay. It can be illustrated on a larger scale by pressing two tooth brushes or hair brushes together, so the bristle inter-1ook. In case of flannel graph similar principle of friction helps an object to cling to the surface of the board.

The flannel board is usually painted to depict a background scene appropriate to the story being told. Paper cutouts of characters and objects in the story are then placeon the board, and moved around, as the story unfolds. These cutouts are backed, either with flannel, or with some other substance that adheres lightly to the flannelbackground, such as coarse sandpaper.

Advantages

1) Permits numerous and varied arrangements of visua1 materials.
2) Permits the use of either chart or small pieces of material Materials can be packed and transported complete notes. 3) Permits the development of a complete story.
4) Promotes conscientious planning, which must precede the development of the material in the first place.
5) Challenges one to develop symbols to portray such things as abstractions.
6) Easier to construct materials for flannel board than to make slides or movies.

Disadvantages:

1) Transportation and storing of boards and materials is a problem. Suitable tables to support boards must be available.
2) Time and cost of making material for presentation present a problem.
3) Cost of boards themselves can't be overlooked.
4) Presentation is limited a new idea involves a lapse of time before the new material can be added
5) Might tend to deter one from using other more effective methods and techniques when it is evident that other methods might be more appropriate.
6) To tell a complete story it often takes either too much board space or smaller designs and materials some of which cannot be seen well.

BULLETIN BOARD

DEFINITION

It is a soft board which will hold pins or tags almost suitable. Simple device placed either indoor or outdoor. Items generally displayed are photographs, publications, posters, newspaper cut outs.

Advantages

Explains important events

Reports special activities

Disadvantages

Not effective for illiterate group.

Takes lot of preplanning and preparation

A bulletin board (pinboard, pin board or notice board in British English) is a place where people can leave public messages, for example, to advertise things to buy or sell, announce events or provide information. Dormitory corridors, well-trafficked hallways, lobbies, and freestanding kiosks often have cork boards attached to facilitate the posting of notices. At some universities, lampposts, bollards, trees, and walls often become impromptu postering sites in areas where official boards are sparse in number.

PEG BOARD

It is a type of board which contains small holes to fix certain letters into the holes

which is used especially in the offices to display certain items, name of the personal or faculty member.

MAGNETIC BOARDS

It is a framed iron sheet carrying porcelain coating in some dark color generally black or green. It can be used to display pictures, cutouts and light objects with disc magnets or magnetic holders.

Advantages

Movement of visual material is easy.

SMART BOARDS

SMART boards put simply, are a sophisticated replacement of the traditional overhead projector. Over the years, this cutting-edge technology has proved popular for students of all ages. The interactive board turns a typical classroom into a fun learning environment. It enriches classrooms in several ways by providing hands on collaboration and creating the perfect learning setting.

There are several advantages of bringing in a SMART interactive whiteboard into a classroom setting. Here are the top 8 advantages of this state-of-the-art technology in the education industry.

Reasons why SMART Boards are an essential component in the modern day classroom:

1. Provides Flexibility: Interactive whiteboards allow many different forms of media - including photos, illustrations, maps, graphs, games, and video, to be displayed. These tools not only enrich the classroom experience but also help to expand the nature of content that can be used in learning. In addition, SMART Boards makes learning to be more dynamic owing to the different forms of presenting information.
2. Enhanced teaching/learning experience: SMART Boards provide new ways for teachers to teach, and student to learn. These tools support a wide variety of learning styles. For instance, visual learners can watch as their tutors use the whiteboards to project visual elements, whereas audio learners can listen and have discussions. On the other hand, the Boards come with touchscreen capabilities that allow tactile learners to touch and interact with the board.
3. Interact and share: The interactive nature of SMART boards offers learners an opportunity to share and participate in the instructional process. Interactivity

provides a platform for students to demonstrate their grasp of the subject through touching, drawing, and writing. Every learner has an opportunity to participate or contribute to the presentation and/or discussion via notebooks and tablets. In addition, the boards provide for rapid assessment whereby learners can receive immediate feedback. Teachers and students are able to identify individual strengths and weaknesses in various subject areas and isolate areas/topics that need more focus or review.

4. Low-Maintenance: SMART Boards are neat and easy to use. There are no hassles cleaning or maintaining whiteboards. The data on the screen can be modified using a specialized highlighting tool or pen. There is no need for using unhygienic chalk or marker pens.
5. Access to online information & tools: SMART boards allow learners to easily access a rich database of online resources. Teachers can use the wide variety of online information sources such as knowledge databases, online video and news items to reinforce their lessons. Learners can also quickly access the wide range of powerful tools and resources to conduct research and supplement their usual study material.
6. Going Green: Interactive boards are also environmentally friendly. They offer teachers an entirely different way of presenting information to students, which eliminates the need for writing, printing or photocopying. Which, contribute to eliminate waste and pollution, from over-utilization of paper and ink.
7. Technology Integration: SMART boards allows for integration of various technologies in order to improve the learning experience. For instance, it is possible to attach tools such as microscopes, document cameras, cameras or video cameras to a whiteboard to aid in instruction. It is also possible to integrate the interactive learning tools with a wide range of software applications.
8. Communication: Interactive whiteboards allow for connectivity in different locations; making ideal collaboration and distance learning environments. When using SMART boards, student show to increase student-to-student collaboration and increase overall participation in the lesson.

Overall, incorporating SMART Boards to the classroom environment is likely to change the way teachers impart knowledge to students and at the same time simplify

the learning process for students. Students will find it easy to engage with lessons and gain a better understanding of the overall lesson.

COMPUTER AS A TOOL IN MODERN TEACHING

Computers have become of the most important learning aids of the modern times. Today's education is considered incomplete without computers. This is the basic machine on which all other electronic medias of learning depend. These can be bought in various forms like desktops, lap tops, notebooks and simply e-readers.

Computers are used to play the computer based educational games which can now be played also through television screens.

The computers have been playing an important tool for teaching from the last few years of the 20th century and since then it has brought about a revolution in the methods of teaching which our future teachers will be using.

The computers make use of multimedia programme which include attractive colours, clear graphics, wonderful sounds, the fascinating animations and enjoyable videos discharging to the students the various elements of their subjects of study.

Some critics of computers as a teaching aid may point out that the conventional methods of teaching in the hands of an enthusiastic, creative and industrious teacher could also do the job as well if not better than a computer. To such critics, I would say that the computers are not there to undermine the role of the efficient teachers. The computers are only a tool in the hands of a teacher to make the teacher's job easy and fast and make the teacher more efficient. A computer or any other teaching tool cannot work at its own; it definitely needs mediation from an enterprising teacher. No one would feel like to do away with the blackboard where it is necessary to use a blackboard or any other conventional tool.

The computer has brought about a tremendous change the way the world looks at the teaching aids. With the advent of internet technology, the use of a computer as part of today's educational aids has become inevitable. Just think of a simple situation where you want to teach a student the word 'trumpet' used for the sound produced by an elephant and expect the student to describe the sound which the elephant makes. Obviously, you cannot bring the elephant to the classroom other than showing its picture. Even if you take the class to the zoo park where is the guarantee that the students can listen to the sound of an elephant trumpeting. But you can play the recorded sound of the elephant through a computer and can also show its picture or even live video of an elephant. For this purpose I have loaded the sound files of all animals, birds and insects to enable

the children to hear the sounds of these living beings through computer in their classrooms.

We can make the young students practice their language lessons including regional languages through computers. I have practically done it for my computer virtually turning the computer lab as a language lab. You can see the image above where the students of a primary class are seriously engaged in learning Hindi through computers.

Computers bring to the students a world of entertainment along with learning by providing computer based educational games for learning various subjects through computers. Many websites on the internet provide these games free for the students and parents and a few also charge nominally for the educational games made available to their members.

INTERACTIVE ELECTRONIC WHITE BOARD AS A TOOL IN MODERN TEACHING

- Interactive electronic white boards of today also known as smart boards are the latest tools in the methods of modern teaching. These need a computer, an overhead projector and preloaded educational software.
- These are very costly equipment and require a lot of investment and can be afforded by only by schools who charge a very high rate of fees from the students. For this reason, these have not become very popular with ordinary schools. It is not only the heavy initial investment if purchased outright which has to be kept in mind but also the day to day costs of running the equipment which should be thought of by the end users. These costs are the high power bills and the replacement of lamps of the projectors which should be given attention to while buying this costly equipment.
- Some companies supplying the white boards like the Edu comp, Smart Boards etc. make offers to the institutions to pay on monthly basis for the equipment and also appoint the support staff for running the system. They charge the institutions monthly charges ranging from Rs.50 to Rs.100 per student dependent upon the school strength. Here also these companies do not apprise the schools about the hidden costs in the form of higher power bills and replacement of projector lamps which the schools have to incur.
- Of course, the electronic white board has many user friendly offering a lot of interaction to its user. It is a colourful tool in the hands of the teachers. Its inter-

activity features are beyond description. But the biggest disadvantage of the electronic white board is that it has to be fixed on the wall and does not leave the place for use of your ordinary blackboard to be used in case of emergencies like the power failure. It is more so if the classroom does not happen to be very big. The projector and the computer has to be always on if you want to use the electronic board.

FLASH CARDS

Definition:

- Flash cards are a set of pictured paper cards of varying sizes that are flashed one by one in a logical sequence."
- Flash cards can be self-made or commercially prepared and are made up of chart or drawing paper, paper using colors or ink on them for drawings."

Purposes:

1. To teach the students.
2. To give health education.
3. Useful for small group.
4. Used in group discussions.

Principles:

- The messages can be brief, simple line drawing or photographs, cartoons and the content will be written in few lines at the back of the each card.
- 10" X 12" or 22" X 28" is commonly used size.
- 10-12 cards for one talk can be used. It should not be less than 3 and more than 20.
- Prepare a picture for each idea which will give visual impact to the idea.
- The height of writing on the flash card is to be approximately 5cm for better visualization.

Using the flashcards:

For class room instruction, the flash card s is to be properly used. The following steps are used while displaying flash cards.

1. Give brief introduction about the lesson to students.
2. Give instructions to students about their actions while you flash the cards.
3. Flash the card in front of the class by holding it high with both your hands so that all the students can see it.
4. Let the student respond as per instructions already given.
5. Review the lesson by selectively using flash cards.

Advantages:

- Flash cards can be used to introduce and present topics.
- It can be used to apply information already gained by students to new situations
- It can be used to review a topic.
- Can be used for drill and practice in elementary classes
- To develop the cognitive abilities of recognition and recall of students.
- It can work as a useful supplementary aid and can be effectively used with other material.

Disadvantages:

- Cannot be used for a large group
- Prone to get spoiled soon
- Preparation is time consuming.

E-FLASHCARDS

An extensive selection of images listed according to theme that helps learners to understand basic vocabulary. These images may be printed out or used with an interactive digital whiteboard. The audio option also tells students how each word is pronounced.

EDUCATIONAL TOYS

Toys are usually used in small classes for teaching the children the names of various fruits, vegetables, animals, birds, insects etc. Toy models of these objects are easily available in the market.

- o Children in lower classes are also given some objects like marbles and beads to learn numbers.
- o Toy clocks and watches are used in schools to teach children the concept of time.

3.5 Advantages, Limitations and Challenges of Using Multimedia in Education

By incorporating multimedia in their instruction, teachers can capture attention, engage learners, explain difficult concepts, inspire creativity, and have fun. However, there are many tools available and many ways to use those tools.

"Multimedia is characterized by the presence of text, pictures, sound, animation and video; some or all of which are organized into some coherent program" (Phillips, 1997).

3.5.1 The Advantages of using Multimedia in Education

1. Deeper understanding

According to research, a benefit of multimedia learning is that it takes advantage of the brain's ability to make connections between verbal and visual representations of content, leading to a deeper understanding, which in turn supports the transfer of learning to other situations. All of this is important in today's 21st century classrooms, as we are preparing students for a future where higher-level thinking; problem solving and collaborative skills will be required.

2. Improved problem solving

A large percentage of the human brain dedicates itself to visual processing. Thus, using images, video and animations alongside a text stimulates the brain. Student attention and retention increase. Under these circumstances, in a multimedia learning environment, students can identify and solve problems more easily compared to the scenario where teaching is made possible only by textbooks.

3. Increased positive emotions

According to psychologist Barbara Fredrickson, experiencing positive emotions makes people see more possibilities in their lives. Using multimedia during instructions impacts student's mood during the learning process. With a positive attitude they learn better and tend to be more proactive.

4. Access to a vast variety of information

With computers, tablets, smartphones and the internet, students are today better equipped than ever to search and find the information they need. A study revealed that 95% of students who have access to internet, use it to search for online information. Sharing the information and participating in class discussions is done in a more confident way when access to information is as easy as today.

5. World exploration

There is no surprise here. With the help of multimedia children can explore and learn about places they would never been to. In a geography class, students can explore different cities of the world, the tallest mountains and the most dangerous jungles. In a science class, space and planets exploration is now possible. In a biology class, the dissection of rare animals and different habitats exploration are like a walk in a park for students benefiting of a multimedia learning environment.

Altogether, multimedia learning environments have a direct effect on learning and even on growing as a person. An effect that differs and can't be achieved as easy whilst using traditional education materials. Therefore, it is no wonder the edutech business is increasing and schools desire more and more to create multimedia learning environments for their students.

Multimedia is very helpful and fruitful in education due to its characteristics of interactivity, flexibility, and the integration of different media that can support learning, take into account individual differences among learners and increase their motivation. The provision of interaction is the biggest advantage of the digital media in comparison with other media. It refers to the process of providing information and response. Interactivity allows control over the presented content to a certain extent: learners can change parameters, observe their results or respond to choice options. They can also control the speed of applications and the amount of repetition to meet their individual needs. Furthermore, the ability to provide feedback tailored to the needs of students distinguishes the interactive multimedia from any other media without a human presence. However, many aspects need to be taken into account when using multimedia in education. Even though multimedia is offered worldwide, access to learning materials and computing equipment differs from country to country. The use of multimedia by students needs to be supported by very skilled teachers. They must guide students through the learning process and provide them with appropriate and effective learning strategies. Like the use of textbooks, the use of educational multimedia fosters teaching strategies, where the teacher's role is not just that of information provider but the one of guide, supporter and facilitator.

Multimedia offers a variety of media usually combined in a meaningful manner. This gives an opportunity to use the computer for the presentation of ideas in different ways, including by means of:

- Images, including scanned photographs, drawings, maps and slides;

- Sounds, e.g. recordings of voice, noise and music;
- Video, including complex procedures and 'talking heads';
- Animation and simulations;
- Discussions among learners (social networks, online discussions, blogs, etc.).

Often, presentations supported by attractive images or animations are visually more appealing than static texts, and they can support the appearance of emotions to complement the information presented. Multimedia can appeal to many types of learning preferences - some students profit more from learning by reading, some by hearing and some by watching, etc. In addition, the use of multimedia allows for different ways of working - students can decide on their own how to explore the materials as well as how to use interactive and collaborative tools. Moreover, students can adjust their own learning processes according to their abilities and preferences. They can work according to their interests, repeat material as much as they want reducing embarrassment concerning their learning outcomes. The use of multimedia can thus be tailored to the students' differences in interests, social and cultural backgrounds, learning preferences and rates, etc. Individual learning can promote active, self-directed learning. In addition, multimedia applications can be used to facilitate group work. Small groups of students can work through multimedia applications together - in order to learn from each other as well as to improve their dialogue skills.

The interactive opportunities of multimedia lead to high flexibility, which can be very helpful for students with special needs:

- Dyslectic students can use synthetic speech in order to become familiar with the content of digital texts.
- Autistic children show an increase of phonologic awareness and word reading by using multimedia (Heimann et al. 1995).
- Students with severe speech and physical impairments gain from learning with multimedia, because the computer is flexible enough to meet individual needs - they can repeat as oft en they want, can hear it loud, etc. (Steelman, 1993).
- For deaf students, the visual presentation of content improves their motivation to learn (Voltena et al., 1995). The computer can noticeably improve student access to information. Such delivery platforms as the World Wide Web provide 24-hour access to information. Moreover, it is relatively easy to update web-based educational materials, i.e. to change design, content, instruction methods, etc.

3.5.2 Limitations of Using Multimedia

Multimedia requires high-end computer systems. Sound, images, animation, and especially video, constitute large amounts of data, which slow down, or may not even fit in a low-end computer. Unlike simple text files created in word processing, multimedia packages require good quality computers. A major disadvantage of writing multimedia courseware is that it may not be accessible to a large section of its intended users if they do not have access to multimedia-capable machines. For this reason, courseware developers should think very carefully about the type of multimedia elements that need to be incorporated into applications and include only those that have significant value. Multimedia has other weaknesses too. While proponents of this new technology are very enthusiastic about its potential, they often leave the financial and technical issues unattended. Developments in multimedia are very high and the process of developing effective multimedia takes time. Further, if the prerequisites for using multimedia include computers with related software, the user must possess a minimum level of computer literacy in order to exploit the capabilities of this medium for learning. And finally, of the educator who is unfamiliar with the production and design of multimedia courseware or packages can be equally complicating. The critical question, then, is: How do we overcome some of the identified barriers and begin the process of multimedia implementation alongside the instructor, textbook, and blackboard? It is the barriers rather than the technologies which we must address before multimedia, or for that matter, any media technology becomes as accepted as the printed text or guidebook.

Following are a few limitations of using Multimedia

- Information overload. Because it is so easy to use, it can contain too much information at once.
- It takes time to compile. Even though it is flexible, it takes time to put the original draft together.
- It can be expensive. Multimedia makes use of a wide range of resources, which can cost a large amount of money.
- Too much makes it unpractical. Large files like video and audio has an effect of the time it takes for a presentation to load. Adding too much can mean that we have to use a larger computer to store the files.
- In case we want to upload it onto the Internet, there are a few factors to keep in mind, for example bandwidth and the user's abilities.

3.5.3 Some Disadvantages of Multimedia in Education

Self-regulated learning: Some learners are not able to handle the freedom provided by hypertext-based multimedia.

Distraction: Often, confused presentations of the material can cause distraction due to conflicting messages. Non-linear structured multimedia allows the user to follow the supplied links, which can distract from the topic to be learned. The massive amount of information provided by multimedia applications may distract our attention during learning.

The human short-term memory is limited; usually it can hold around 7 pieces of information. When several media presented at the same time, the learner can only concentrate on some of them and ignore others. This could result in ignoring important information. Human beings cannot use all channels available simultaneously, and this can prevent us from realizing the full potential of multimedia.

Low interactivity: Even though the interactivity between the learner and multimedia applications is increasing, it is still considered restricted compared to the elaborated human-human interactivity.

No selective feedback: Feedback is generally very limited within computer-assisted learning packages. Generally, computers can't substitute for person-to-person teaching, only enhance it. Often, the feedback provided is limited to right/wrong, and it does not support in learning strategies or further content explanations. Multimedia applications cannot identify individual needs or problems of the learner, so they cannot respond like people.

Simulations are often not enough: It may be important for students to have true hands-on experience. For example, for studying insects in biology it is necessary to go out in nature, to see insects living in their natural environments.

Lack of skills - pupils and teachers: Students, particularly mature-age students, may not be ICT literate. Also teachers may lack some personal skills, which are needed to teach effectively with multimedia.

Difficult to do: Creating audio, video and graphical materials can be more challenging than creating ordinary texts.

Time consuming: Using multimedia can be time consuming. Especially the production of multimedia takes much time.

Access: Not all students have appropriate access to proper hardware and the Internet. This may limit the scope of teaching.

Social in/exclusion: Not all members of a society can be involved in the use of

multimedia technology due to lack of access to the Internet or lack of hardware to make full use of the educational material on the web.

Equipment problems: Hardware and software needs to be configured in a way that their usage is as simple as straight forwarded as possible.

Bandwidth issue: Limited bandwidth means slow performance for sound, graphics and video, interrupting streaming and causing long waits for download that can affect the ease of learning.

Multimedia is portable: Paper-based notes can be read everywhere, on the bus, at the beach, etc., but web-based materials or multimedia materials require specific hardware devices.

Computer screens aren't paper: The content on screens may not be as easy to read as the content on paper. If there are large chunks of information that need to be read from top to bottom, it is probably best to view such a document on paper. Books and journal articles may still be better to read in paper. End users often prefer to use technology to search for information, but when it comes to reading, they tend to read from print-outs.

In summary, multimedia products can be used to represent and process various types of knowledge. They can be used as means of representation and communication of knowledge. The use of these products can foster students' construction of their own knowledge. They can construct knowledge and develop skills related to various subjects by accessing or producing digital representations of knowledge. In particular, they can develop literacy and other core competencies. For example, they can develop motivation for learning activities, communication abilities, social competencies as well as learning competencies, values and ethics.

3.6 Recent Trends in Multimedia

The technological advancements have made society take a leap towards success. Every technological reform is a small step towards advancement. Every new invention in technology is a step towards progress of mankind.

Centuries ago, hardly anyone would have even dreamt of working on a computer. Generations of the yester years would have hardly imagined being able to communicate with people on the other side of the globe. But there were some intelligent minds to dared to dream of such revolutionary discoveries and they made the impossible possible.

Since several years ago, education experts had been proposing a new style of education involving using multimedia, which differs radically from the traditional ways. Changing the education systems as a new ways is towards a new paradigm for teach (Rosenberg, 2001).

The development of multimedia technologies for learning offers new ways in which learning can take place in education areas. In last decades, there has been a growing interest in the creation and use of multimedia technologies throughout the education world. There have been many experiments and innovations in the field of education and training regarding knowledge delivery (Tally, 2002).

From face to face to virtual education, different technologies have played great roles at different times. In the last decades, due to the advent of multimedia technologies has got new meaning (Del, 1998; Moreno, 2000). Development, access, and transfer of text, sound, and video data gave given a unique face to education centers, in the form of multimedia learning. The development of multimedia systems can be very rewarding. So interest and investment in this technology are increasing and multimedia technologies are the need of the day (Bransford, 1990; Mayer, 1990).

Multimedia Technologies as an Educational Tool throughout the 1980s and 1990s, the concept of multimedia took on a new meaning, as the capabilities of satellites, computers, audio and video converged to create new media with enormous potential. Combined with the advances in hardware and software, these technologies were able to provide enhanced learning facility and with attention to the specific needs of individual users (Fenrich, 1997; Meyer, 2001; Mayer, 2003).

Multimedia is a term frequently heard and discussed among educational technologists today. Now multimedia technologies these called "new media," "hypermedia," "integrated media," or more commonly "multimedia" have been defined in a number of ways. Actually the term "multimedia" covers a lot of territory. "Multimedia", in its broadest sense, means graphics, music, sound effects, voice, video, and animation, in any combination, in the same program or presentation (Blumenfeld, 1991. Fensham,, 1990). It can be defined as an integration of multiple media elements (audio, video, graphics, text, animation, etc.) into one synergetic and symbiotic whole that results in more benefits for the end user than any one of the media elements can provide individually.

Multimedia can be defined generically as any combination of two or more media such as sound, images, text, animation, and video. For educational technology purposes,

multimedia refers to computer-based systems that use associative linkages to allow users to navigate and retrieve information stored in a combination of text, sounds, graphics, video, movies, music, lighting and other media as for education (Meyer, 2001; www.wps.prenhall.com; Sandholtz, 1997; Vanbuel, 2006).

When the term is used with computer technology, multimedia refers to a variety of applications that combine media and that use CD-ROM, video, audio, DVD, and other media equipment. As it seen multimedia is the combined use of media, such as images, video, audio, CD/DVD-ROMs, the internet and interactive applications such as applets and flash for education and entertainment (Chang, 2004; Finn, 2002).

Multimedia hardware requirements include a basic computer system with the standard input devices, central processor, and output devices, CD-ROMs or DVDs, sound boards or cards, speakers, video boards, highspeed central processors, extensive secondary storage or hard disk (Lieshout, 2001; Millar, 2005).

Multimedia's basic technologies include text, maps, graphic images, electronic presentations, animation, videoconferencing, digital audio and video, web learning environment, videoconferencing systems (Lieshout and etc, 2001; Phillips, 1997; Behrens, 1996, 1997; Bijnens 2004, 2005; Cleveland, 1998).

Multimedia combines five basic types of media into the learning environment; text, video, sound, graphics and animation, thus providing a powerful new tool for education (Duke, 1993). These are to demonstrate abstract concepts, to accommodate students with a variety of learning styles, to engage students, to enable active learning, by incorporating multimedia into learning, activities, students can manipulate, create and interact with material rather than just absorb representations created by others (Kearsley, 1998; Person, 2003).

Multimedia technologies have a lot of advantages such as; widely available, reusable, multimedia, and decrease pressure on lecturer, better individual student engagement, globality (Repman, 1993; West, 2006). These are fun and interesting, provide a pre question, and make description a narration, no need to include an image or video of the narrator, unless there's some demonstration. Do not include explanation in both text and narration styles, Give students chance to pause the video/audio and ask questions, Make the multimedia interactive, Provide pre training on key components, concepts in the multimedia to enhance students' understanding of the multimedia resource, Presenting more materials may result in less understanding (Mayer, Heiser, and Lonn, 2001; Mayer, Dow and Mayer, 2003; Wallace, 2006).

E-LEARNING

E-Learning is the use of technology to enable people to learn anytime and anywhere. E-Learning can include training, the delivery of just-in-time information and guidance from experts. It is a new education concept by using the Internet technology, it deliveries the digital content, provides a learner-orient environment for the teachers and students. The e-learning promotes the construction of life-long learning opinions and learning society. Delivery of the digital content is the main characters of e-learning. E-Learning is an important consideration in education for several reasons:

1. Implemented correctly, it can reduce some of the costs associated with education
2. It allows schools to educate people they could not previously (e.g. people that work for a living, people geographically dispersed, etc.)
3. Many students communicate better in a web based environment than in the traditional classroom. Studies have shown that students who would not raise a hand in class will be very active in posting to discussion boards for example. E-Learning is a challenge for educational institutions because the technology involved can be difficult to manage and use. A lot of training or practice is required to get proficient in e-Learning solutions. For example, Flash based applications need to target customers that have a large learning audience to justify the expense. Virtual classrooms are often a more cost efficient solution in many cases. E-Learning is an active and growing industry. It may take a hit with the economy being like it is but it will reemerge very strong.

3.7 Implications of Multimedia in Teaching and Learning

Education encounters, in modern times, challenges in all aspects of social, economic & cultural life; the most important of which are over-population, over-knowledge, education philosophy development & the change of teacher's role, the spread of illiteracy, lack of the staff & the technological development & mass media (Aloraini, 2005, p. 30-32). This drove the teaching staff to use the modern teaching technologies to face some of the main problems, which education & its productivity encounter, by increasing the learning level which may be achieved through providing equivalent opportunities for all people whenever & wherever they are, while taking into account the individual differences between learners (Wilkinson, 1986, p. 13 & Abd El-Halim Said, 1997, p. 19). To improve the educational productivity, some of the teaching staff sought to mainstream technology within education, developing traditional techniques & using new educational methods (Al-A'ny, 2000).

Mainstreaming the technological media within what is called "Multimedia" is the pattern which led to infinite applications of computer technologies. The concept of this technology came into being with the appearance of sound cards, then compact disks, then came the use of digital camera, then the video which made computer an essential educational tool. Nowadays, multimedia expanded to become a field on its own.

Interaction is the main element in multimedia technology as most of its applications are characterized by interaction. Consequently, multimedia programs may provide a more effective & more influential experiment than using each technology separately.

Multimedia is one of the best educational techniques because it addresses more than one sense simultaneously, as it addresses the senses of sight & hearing. Multimedia programs provide different stimuli in their presentations which include a number of elements some of which are (Aloraini, 2005, p. 55-75):

Texts

Spoken words

Sound& music,

Graphics,

Animations and

Still pictures

Some of the potential advantages of multimedia programs are:

1. They make the reading process a dynamic one instead of the written presentation of the texts printed in the book (Zaitoun, 2002, p. 259).
2. Presenting different drawings & pictures supports the clarification of ideas & communication of information.
3. Moving easily from a presented subject to another provides a good chance for questions & discussions.
4. Using different presentations like video clips along with maps or other kinds of presentations help to get the information closer to reality. Adding music makes the idea clearer and it attracts the attention of the learners (Aloraini, 2005, p. 73).
5. They rise the attention & interaction between students & the educational subject (Qandeel, 1998, p. 1625).
6. They comprise the elements of amusement & suspense (Qandeel, 1998, p. 1625).

7. They are graded according to the learner's abilities from easy to difficult ones (Qandeel, 1998, p. 1625).
8. They provide teachers with a new educational style & encourage curiosity (Holsinger, 1995, p. 9).
9. They help teachers & learners look into topics from a broader perspective as each topic comprises enormous information (Holsinger, 1995, p. 9).
10. They guide learners to peer learning (Alfar, 2009, p. 123).
11. They are concerned with providing simultaneous feedback (Qandeel, 1998, p. 1625).
12. They help learners remember & transfer their knowledge (Alfar, 2009, p. 123).
13. They support the user's work & innovation, which makes the possession of a computer a necessity for both the student & the teacher.

Teaching and learning are two complementary aspects of education. Within learning, there are two key elements: content, which forms the "what" of learning; and skills, which describe the application of content to specific tasks, or the "how." These two elements are mirrored in teaching by the curriculum and syllabus (the "what") and the teaching methodology (the "how"). Multimedia technology affects both aspects of teaching and learning. It does this in three ways: in how it presents information; in how students interact both with the medium and through the medium with the teacher and other learners; and in how knowledge is structured within multimedia.

Multimedia can represent knowledge in more ways than text or speech can. Multimedia combines text, audio, visual, graphic, and dynamic elements, such as animation and video. This presents learners and teachers with unique learning resources that can be used in a wide variety of ways to stimulate various forms of learning. The most significant feature of the multiple forms of media is that they allow for the presentation of knowledge in numerous ways. Thus students can learn about abstract principles through text and can see the application of those principles through an animation or a video example. This presents the opportunity for deeper levels of understanding, particularly if the presentational qualities are fully and deliberately exploited to achieve this purpose and are combined with the potential for learner interaction. Well-designed applications of multimedia then can do two things: they can enable learners to come to understandings more quickly than through more conventional classroom or textual media; and perhaps more significant, they can change how we come to know or to understand and hence what we know and understand. In other words, a

learner may have an image or a mental "construction" that is far richer than an abstract verbal understanding. From an educational perspective, it is essential that learners can move confidently between concrete and abstract understandings and not become locked into one or the other. This does not happen by accident. Multimedia needs to be carefully designed to facilitate the development of this kind of thinking. Thus the role of the teacher is by no means diminished; indeed, such design requires highly skilled teachers working in teams with multimedia producers.

3.8 Let Us Sum Up

1. Multimedia is the encompass of all media used in electronics, particularly with computers. The use of computers to present text, graphics, video, animation, and sound in an integrated way. Long touted as the future revolution in computing, multimedia applications were, until the mid-90s, uncommon due to the expensive hardware required. With increases in performance and decreases in price, however, multimedia is now commonplace. Nearly all Personal Computers are capable of displaying video, though the resolution available depends on the power of the computer's video adapter and microprocessor.
2. Technology does not necessarily drive education. That role belongs to the learning needs of students. With multimedia, the process of learning can become more goal oriented, more participatory, flexible in time and space, unaffected by distances and tailored to individual learning styles, and increase collaboration between teachers and students. Multimedia enables learning to become fun and friendly, without fear of inadequacies or failure.
3. Interactive Multimedia is the means to interface with these media typically with a computer keyboard, mouse, touch screen, on screen buttons, and text entry allowing a user to make decisions as to what takes place next.
4. Specific uses of multimedia include:Drill and practice to master basic skills the development of writing skill problem solving understanding abstract mathematics and science concepts simulation in science and mathematics manipulation of data acquisition of computer skills for general purposes, and for business and vocational training access and communication to understand populations and students access for teachers and students in remote locations individualized and cooperative learning management and administration of classroom activities.
5. Role of Teacher in Multimedia Approach

- Teacher has to adopt a number of methods and techniques.

- Teacher has to aware of the different available media and their availability.
- Teacher should be physically competent to use and demonstrate the use of the different media.
- Teacher should be skillful enough to make a judicious choice of media and competent enough to mix them sequentially and in an orderly manner.
- Teacher's role is that of a facilitator or manager of activities.
- Teacher has to lead his student for independent, individualized learning.

6. Advantages of the multimedia Approach

- Multimedia approach enables the student to represent information using several different media.
- Can arouse the curiosity among the learner and provide them vivid impressions.
- Multimedia can take into account different learning styles - some pupil learn by interpreting text, while others require more graphical representations.
- Can develop a positive attitude among the learners towards the teaching-learning process.
- Multimedia Approach allows for self-pacing
- Technique of simulation can be effectively applied through the multimedia approach.
- Helps in development of higher order thinking skills.
- Multimedia approach provides the student the flexibility of 'anywhere', 'any time' learning.
- Helps in developing group and interpersonal skills.
- Effective remediation programmes can be implemented through the multimedia approach.
- Multimedia approach can bridge language barriers since audio is not the only means of communication.

7. Disadvantages of the multimedia Approach

- Requires highly sophisticated infrastructure facilities, which may lead to heavy financial burden.
- Expertise and skill are required to operate the multimedia devices, which will lead to the problem of non-availability of human resources.
- Not feasible in the all topics of study.

8. With a multimedia approach, the student could also access Web sites on the Internet to get more information. The student could then add film clips on these animals in their natural habitat (all may be from the same CD-ROM) and blend them into a report. Then by adding titles and credits, the student now has a new and original way of communicating his/her own individual perspective.
9. With multimedia simulation technique can be effectively applied. By using simulation, student can grasp a better understanding about the step and producer to make or do a certain project. This can improve their understanding and also help improving their skills.
10. Multimedia possessed a lot of advantages to make learning interesting. With the help of its elements, it can invoke creativity in both teacher and students so that they can apply it in order to teach or learn. Learning also becomes much easier with the help of multimedia. Multimedia can help improve our educational system.

3.9 Check Your Progress

1. Define Multimedia. Briefly discuss the advantages of multimedia learning over traditional learning.
2. Comment on the recent trends in Multimedia teaching and learning process.
3. How had multimedia changed the educational scenario? Explain.
4. Give a comparative study on the advantages of smart board over blackboard.

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Unit 4 ❐ Technology Based Instruction

Structure

4.1 Introduction

The effective Use of Technology in Education has changed the face of education and it has created more educational opportunities. Both teachers and students have benefited from various educational technologies, teachers have learned how to integrate technology in their classrooms and students are getting more interested in learning with technology. The use of technology in education has removed educational boundaries, both students and teachers can collaborate in real time using advanced educational technologies.

Technology has helped in the growth of mobile learning and long distance learning. The use of internet technology has enabled teachers to reach students across boarders and also students from developing countries have used internet technology to subscribe for advanced educational courses. Many universities and colleges have embraced online education by creating virtual classrooms. Online education is flexible and affordable, students can attend classrooms during their free time, and they can also have a chance to interact with other students virtually.

Recent advancements in educational technologies have yielded positive results in our education sector. This new educational technology is supporting both teaching and learning processes, technology has digitized classrooms through digital learning tools like, computers, iPads, smartphones, smart digital white boards; it has expanded course offerings, it has increased student's engagement and motivation towards learning.

The teaching strategies based on educational technology can be described as ethical practices that facilitate the students' learning and boost their capacity, productivity, and performance. Technology integration in education inspires positive changes in teaching methods on an international level.

Benefits of Technology in a Special Educational Classroom

1. Most students are drawn to technology and special education teachers often find that these students are then more motivated to work because they get to use a technology device in the classroom.
2. Teachers can work with more students at one time more effectively, such as using a phonetic ear so that more students can hear or a clicker response system to engage all of the students at once.
3. Technology is an equalizer and parents even report that when their children with challenges or disabilities uses technology that they are seen as more capable by peers.

4. Children learn valuable technology skills that can translate into marketable skills.
5. Children with physical disabilities have more opportunities for engaged learned with modified assistive technology such as touch screens and assistive wands.
6. Students who spend time in mainstream classes and special education classrooms can use technology to bridge the expectations and demands of each, such as by using a device to record lectures for playback later.
7. Technology can help build confidence in children. They are finding more success academically and they are also feeling more like their classmates who utilize technology every day, too.

Even though there are many other tools that are valuable to special education teachers, technology can be counted as a beneficial resource that can turn special education classrooms into launch-pads for learning - and life.

4.2 Objectives

After going through this unit you will be able to

- discuss how to enhancing Technology Friendly Practices among Teachers.
- discuss about the importance of Computer-Assisted & Computer Managed Instructions, Cybernetics, E- learning, Use of Net Search and Websites
- discuss about Disability Friendly Technology - Punarjani, and e-learning Framework developed by C-DAC 4.4 Developing Technology Integrated Lessons - Individual and Group
- discuss the implications of Technology based instruction in Inclusion

4.3 Enhancing Technology Friendly Practices Among Teachers

4.3.1 Technology and Teaching Practice

Thomas Edison once said, "Books will soon be obsolete in the public schools…our school system will be completely changed inside of ten years." Amazingly enough, however, one of our nation's most important inventors was proven quite wrong. The education system has a remarkable resistance to innovation and the classroom experience has changed very little in the 100 years since Edison's prediction.

Advances in information technology have revolutionized how people communicate and learn in nearly every aspect of modern life except for education. The short school

day and the break in the summer were meant to allow children to work on family farms. Schools have an enduring industrial mentality placing students in arbitrary groups based on their age regardless of their competencies.

Technology has failed to transform our schools because the education governance system insulates them from the disruptions that technology creates in other organizations. The government regulates schools perhaps more than any other organization. Rules govern where students study, how they will learn, and who will teach them.

To overcome these obstacles, we must persuade teachers that technology will empower them and help their students learn.

There are five strategies for successful teacher adoption of education technology and that these principles will help fulfill the potential that Edison saw a century ago:

Schools must use technology that empowers teachers. Teachers rightly reject education technologies that divert their attention from instruction. The best education technologies enable teachers to do more with fewer resources. Communication platforms like Twitter and Facebook enable dynamic communication with students. Teacher-empowering technologies include mobile apps that grade written student work and provide lesson plan databases. School systems need to aggressively track what works for their teachers and put all other unworkable technologies aside.

Teachers should treat the adoption of technology as part of lesson planning. Teachers can incorporate technology directly into their practice and insulate their students from the deleterious effects of policy churn. Systematic adoption of technology at the classroom levels limits the damage of shifting policy maker priorities.

Teachers should not fear open-source technologies. Many mistakenly believe that education technologies are expensive and complicated to use. Open-source technologies are stable, secure, and compatible with other platforms. Organizations both small and large use open source devices every day. Many businesses use open-source servers for their efficiency and costs savings. They often have large communities that provide high quality customer support. Best of all, open-source technologies often cost less than proprietary products.

Use online education portfolios to evaluate students. Educators have known about the benefits of paper based portfolios for generations. Portfolios allow students to express creativity for difficult to assess subjects. Teachers can choose from a variety of online portfolio providers tailored to the needs of their classroom. They also serve as a platform for students to demonstrate growth. Online portfolios have many advantages over paper based options because they cost less and allow for more robust outreach. Online

portfolios are also amenable to a wider variety of formats including video, music or other interactive features.

Teachers should embrace the Common Core State Standards. Common standards make teaching simpler. Teachers have to write lessons that comply with district, state, and national standards (e.g. NCTM or NCTE). Having a single set of standards eliminates redundancy and conflicting guidelines. Furthermore universal adoption of common standards will support future technological innovations that aid teachers. From a technical perspective, standards facilitate the development of new technologies. Innovators can focus on developing tools that better serve students rather than solving technical challenges of interoperability created by multiple sets of standards.

Undoubtedly weak financial support inhibits the adoption of education technology. Despite this obstacle, teachers working together have tremendous potential to reform education. Every day teachers face choices about how to implement the curriculum and instruct students. Those moments are opportunities for teachers to engage in education reform that has a real impact on students. Teachers should use education technologies that are inexpensive, easy to use, and improve student learning.

4.3.2 Role of Technology in School Management to Enhance Learning:

India has one of the largest networks of schools in the world. During the last five decades the system has grown manifold in size both in terms of institutions and enrolment. Some say, that the nature of Indian education system shifted from an elite system to a system of mass education. For instance, the number of primary schools was around 200,000 in 1950, which is at present more than 600,000. If one were to take into consideration the number of alternate schools that have sprung up in recent years, and include the upper primary and secondary schools, the network consists of more than a million schools. Traditionally, school education acquired immense importance in the post-Independence period and with the consequent expansion of the system, the role of the school teacher also underwent a significant transformation. An important consequence of the expanding system of schools, with ever increasing enrolment and acquiring of mass character, has been the increase in complexity of school management. The changing pace of technology development like ICT and knowledge revolution has made the job of the teacher more demanding. They are required and should be encouraged to assume the new roles and responsibilities for ICT to improve the quality of education and access to education by learners in an informal and non-formal education setting. (Govinda, 2002) The system demands new knowledge and skills from the teacher and head teachers. It also demands greater capability at the school level to respond to the emerging diversity in the student population and among those entering the teaching

profession. In effect, changes in the characteristics of the system have made the role of the school teacher even more critical than what it was earlier. Has the State, which is the main provider of education in the country, responded to the changed reality? Has the teacher become more empowered? Have adequate efforts been made to equip the teacher to face the emerging challenges? What is the current reality with respect to status, roles and functions of the teacher and the head teachers in India? And how can we come out from this challenge? These are few issues which need attention especially now when the country is moving towards becoming a knowledge center and quality education has become determinate in such process.

4.3.3 An Overview of Teacher Managerial Function in the Class Room

Historically, most of teachers restricted their role to teaching. The different government organizations and departments provided a guide line for the role and responsibility of the teacher. The teacher plays multiple roles in the school. The role of teacher is assessed in terms of his/her attendance in the class, completion of the course and interpersonal relation in the school. Till now, hardly any indicator is developed to assess the performance of teacher on the basis of learning achievement of the student. The critical managerial functions of a teacher in elementary education are similar to those in other sectors. These are:

(i) Administration. Administration refers to the direction, control, management and organization of human and material resources for educational growth and development.

(ii) Personnel management. Planning and managing human resources is personnel management. It includes recruitment, transfer and redeployment; promotional opportunities and performance appraisal systems, grievance redressal mechanisms and professional development issues.

(iii) Planning. Planning is a systematic exercise of determining a future course of action in accordance with identified objectives, needs, priorities and existing/likely capacities, within a given time frame, reflecting cost-effective choices.

(iv) Financial management. Financial management refers to mobilization, deployment and efficient use of financial resources as per stated objectives and strategies.

(v) Supervision, monitoring and support. Monitoring and facilitation of teaching-learning processes, and other school development activities, for enhancing their

quality through suitable tools, methods and mechanisms. The focus is on school, because this is the unit where primary learning takes place, and any effort to improve the quality of processes should ultimately be reflected here.

4.3.4 Benefits of Technology in the Classroom

As we sail through the 21st century, technology in the classroom is becoming more and more predominant. Tablets are replacing our textbooks, and we can research just about anything that we want to on our smartphones. Social media has become commonplace, and the way we use technology has completely transformed the way we live or lives.

Educators, too, have seen firsthand the benefits of technology in the classroom. Educators also recognize the importance of developing these technological skills in students so they will be prepared to enter the workforce once they complete their schooling.

The impact that technology has had on today's schools has been quite significant. This widespread adoption of technology has completely changed how teachers teach and students learn. Teachers are learning how to teach with emerging technologies (tablets, iPads, Smart Boards, digital cameras, computers), while students are using advanced technology to shape how they learn. Here are a few benefits of using technology in the classroom.

Technology in the Classroom Makes Learning More Fun

Students prefer technology because they believe that it makes learning more interesting and fun. They especially like laptops and tablets. Subjects that students deem challenging or boring can become more interesting with virtual lessons, through a video, or when using a tablet.

Technology Prepares Students for the Future

Using technology in the classroom would help prepare them for the digital future. These 21st-century skills are essential in order to be successful in this day and age. Jobs that may not have had a digital component in the past, may have one now. Education isn't just about memorizing facts and vocabulary words, it's about solving complex problems and being to collaborate with others in the workforce. Ed-tech in the classroom prepares students for their future and sets them up for this increasing digital economy.

Improved Retention Rate

Technology helps them retain information better. Technology indeed helps students remember what they learn.

Technology Helps Students Learn at Their Own Pace

Today's technology enables students to learn at their own pace. For example, almost all apps allow for individualized instruction. Students can learn according to their abilities and needs. This form of teaching is also great for the teacher because it gives him/her the time to work individually with students who may be struggling.

Technology Connects with Students

Technology occupies an important place within students' lives. When they are not in school, just about everything that they do is connected in some way to technology. By integrating technology into the classroom, teachers are changing the way they used to teach and providing students with the tools that will take them into the 21st century.

Technology changes by the minute, and as educators we need to keep up with the times in order to best prepare our students for this ever-changing world that we live in. While we just saw how integrating technology into the classroom has its benefits, it's important to note that traditional learning processes are just as essential.

4.3.5 Teacher Technology Competencies

Teachers need to improve knowledge and skills to enhance, improve and explore their teaching practices. Many of the studies on competencies of teachers focus on the teaching role of teachers in the classroom rather than teachers' competencies. Competencies are defined as "the set of knowledge, skills, and experience necessary for future, which manifests in activities" (Katane et.al. Gupta defines competencies as "knowledge, skills, attitudes, values, motivations and beliefs people need in order to be successful in a job."

ICT competencies are based on using tools and technical equipment for the reaching, disturbing and transferring the knowledge. They include any technology that helps to produce, manipulate, store, communicate, and/or disseminate information. It means that the ICT competency is very important to improve the communication in the learning and teaching process. The ICT Competencies are a set of technology standards that define

proficiency in using computer technology in the classroom. The competencies consist of computer-related skills grouped into four general domains:

(1) Basic Technology Operation,

(2) Personal and Professional Use of Technology Tools,

(3) Social, Ethical, and Human Issues, and

(4) Application of Technology in Instruction.

4.3.6 Importance of ICT Competency for Teachers

Teaching is a complex activity. Competent teachers apply broad, deep, and integrated sets of knowledge and skills as they plan for, implement, and revise instruction. Technology proficiency (including technical skills and instructional applications) is but one dimension of teacher competence. The acquisition of technology knowledge and skills must be connected with the development of a broader array of competencies. Early attempts to develop technology standards for teachers were isolated from the broader teacher competencies and were focused primarily on technology skills. Consequently these competencies were largely ignored by teacher-training institutions. Typically, colleges of education simply required a single media course to satisfy accreditation requirements; often, colleges were reluctant to insert yet another course into an already overloaded curriculum. The International Society for Technology in Education (ISTE) has actively addressed the technology isolation problem and has recently released a set of revised teacher technology standards. Developed through a rigorous process of expert and lay-person input, the NETS-T Project (National Educational Technology Standards for Teachers) explicitly describes what competent teachers should know and should be able to do with technology in the context of broader teacher competencies.

The NETS-T standards are categorized as follows:

1. Technology operations and concepts,
2. Planning and designing learning environments and experiences,
3. Teaching, learning, and the curriculum,
4. Assessment and evaluation
5. Productivity and professional practice,
6. Social, ethical, legal, and human issues.

4.3.7 Basic Technology Competencies

Fundamental skills come first - like managing electronic files, using computerized databases and spreadsheets, sending and receiving e-mail messages, and creating documents with graphics. These skills are prerequisites for more advanced skills, such as accessing online resources, creating desktop publishing documents, developing multimedia presentations, selecting and customizing instructional software to fit students' needs, streamlining recordkeeping and other administrative procedures with electronic tools, and observing the correct protocols in sharing intellectual property. The competencies are organized into five aspects: productivity, communication, research, media and presentation.

1. **Productivity**

- Produce and manage learning documents. This includes composing standard educational publications such as parent newsletters and handouts for students and class lists; teaching students how to prepare their own documents on a computer.
- Analyze quantitative data. This includes administrative work such as putting student test scores into a spreadsheet and analyzing them, as well as preparing curriculum materials with digital tables and graphs of curriculum content.
- Organize information graphically. He or she can use specialized graphic organizer programs, as well as general tools such as word processors or presentation programs, to create digital representations of educational information.

2. **Research**

- Use effective online search strategies. In their professional preparation, as well as in their classroom assignments, the teacher chooses the most appropriate research tools and databases, and applies the most effective search techniques, to produce useful and safe online resources in the classroom.
- Evaluate and compare online information and sources. Once located, the teacher knows the difference between authoritative and untrustworthy sources, how to 4 ascertain authorship, and how to find sources with different points of view. And can teach these skills to students.
- Save and cite online information and sources. The teacher knows a variety of methods for bookmarking and saving valuable online resources so that may easily be found later and employed in learning materials.

3. **Communication**

- Communicate using digital tools. These include email, instant messaging, mobile colleagues, and knowing how to organize and manage these tools in the classroom.
- Collaborate online for learning. Takes advantage of the tools listed above plus blogs, wikis, chats, audio and videoconferencing to bring outside resources into the classroom and to encourage academic collaboration among students.
- Publish learning resources online. From a simple teacher's web site to a complex curriculum wiki to the online posting of student projects, to podcasting, the teacher has mastered an array of tools and techniques for publishing learning materials online.

4. **Media**

- Differentiate instruction with digital media. This includes an awareness of assistive technologies for disabled students as well as the ability to use a computer to prepare and present academic ideas in a variety of forms for better learning by all students.
- Capture and edit images, audio, and video. The teacher can use digital still and video cameras, edit their output on a computer, and produce learning materials that range from simple slide shows to the archiving of student presentations and performances.
- Produce digital multimedia educational experiences. The teacher can combine media from a wide array of sources into a useful presentation of academic content, and can teach this skill to students.

5. **Presentation**

- Create effective digital presentations. Using common tools for preparing slide shows, videos, and podcasts, the teacher can create presentations that follow the principles of communication, and can apply these design principles to the evaluation of students' digital work.
- Deliver digital multimedia presentations. Using common devices such as computers, projectors, and screens, the teacher can set up classroom presentations and arrange for students to do the same.
- Employ new media devices for learning. From large Smart Boards to tiny iPods to science probes, the teacher can incorporate a variety of digital devices into the instruction in the classroom.

Those are the skills that just about every teacher needs, no matter the subject or grade. Beyond these are the more specific technical skills required of a high school math teacher or a teacher of visually-impaired students, competencies that would be embedded into specialized courses and programs.

4.3.8 Strategies for Preparing Teachers to Use Technologies

Given the importance of well-trained teachers for technologies to be effective in enhancing learning, what might education policy makers do to support and encourage appropriate strategies for training teachers? No single approach to professional development will meet the learning needs of all teachers seeking to develop skills and knowledge in the integration and application of technology.

Teachers' progress through a series of five predictable stages as their expertise in technology adoption and integration evolves. It is likely that within a school, and certainly within a district, teachers will exhibit varying levels of expertise and therefore a variety of different professional-development opportunities will be required.

In contrast, learning that occurs outside the confines of programs provided by institutions is considered informal learning. Informal learning, sometimes referred to as self-directed learning, typically occurs in the learner's "natural setting" and is initiated and conducted independently (Merriam & Caffarella, 1999). Policy makers may want to consider both kinds of approaches. A brief overview of the kinds of possible training strategies is as follows:

Encouraging Teachers to Acquire Necessary Skills: For many teachers, having access to technologies is not viewed initially as a benefit. Teachers may consider technologies yet another demand on their time, a set of tools they did not ask for and do not know how to use. Some teachers feel they are already doing a good job in the classroom and wonder how technologies will contribute to improvements. Still other teachers, of course, welcome the technologies and are eager to learn how to use them. Policies that either mandate or provide opportunities will cost money, but without the establishment of policy that mandates or provides professional-development opportunities (or, ideally, both), teachers are unlikely to 0acquire the skills they need to use the technologies available to them, thus negating the potential benefits of the investment that has been made in infrastructure.

Providing sustained support for Teachers' use of Technologies: It is very important for teachers to acquire knowledge and skills in how to use technologies. But once teachers

begin to acquire such skills and begin to use technologies, there is a need to provide means of continuing support to teacher use of technologies. That is, initial training of teachers is not likely to guarantee that the technology infrastructure will continue to be used.

Evaluating Teacher Use of Technologies: The issue for education policy makers here concerns the extent to which a teacher uses technologies effectively, which can or should be an important criterion in evaluating a teacher's performance. This is a complicated issue for policy makers. This general issue is complex in part because of divided opinion on how important technology use is to the future well-being of individual citizens in a given entity, or to the entity as a whole. There are many writers who make the argument that neither an individual nor a state or nation can hope to survive or prosper unless they are very familiar with technologies. Others dispute this claim and worry about the survival of traditional cultural values in a technological age. Given this deeply-rooted controversy, establishing policy according to which teacher performance will be judged is of critical importance.

Teachers are central to the effectiveness of technology infrastructures that serve education. How teachers acquire the skills they need to use technologies and how the technology is actually used and to what ends, are critical policy domains that must be carefully explored. Hopefully, issues of this nature will be considered as decisions are made about technology and as educators make decisions about the future shape of their schools.

4.4 Computer Assisted and Computer Managed Instrcutions, Cybernatics, E-Learning, Use of Net Search and Websites

4.4.1 Computer Assisted Instruction (CAI)

A self-learning technique, usually off line/online, involving interaction of the student with programmed instructional materials.Computer Assisted Instruction(CAI)is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. CAI uses a combination of text, graphics, sound and video in enhancing the learning process. The computer has many purposes in the class room, and it can be utilized to help a student in all areas of the curriculum.CAI refers to the use of the computer as a tool to facilitate and improve instruction.CAI programs use tutorials, drill and practice,simulation,and problem solving approaches to present topics and they test the students understandings.

Typical CAI Provides

1. Text or multimedia content
2. Multiple-choice questions
3. Problems
4. Immediate feedback
5. Notes on incorrect responses
6. Summarizesstudents' performance
7. Exercises for practice
8. Worksheets and tests.

Types of Computer Assisted Instruction

1. Drill-and-practice

Drill and practice provides opportunities or students to repeatedly practice the skills that have previously been presented and that further practice is necessary for mastery.

2. Tutorial

Tutorial activity includes both the presentation of information and its extension into different forms of work, including drill practice, games and simulation.

3. Games

Games software often creates a contest to achieve the highest score and either beat others or beat the computer.

4. Simulation

Simulation software can provide an approximation of reality that does not require the expense of real life or its risks.

5. Discovery

Discovery approach provides a large database of information specific to a course or content area and challenges the learner to analyze, compare, infer and evaluate based on their explorations of the data.

6. Problem solving

This approach helps children develop specific problem solving skills and strategies.

Advantages of Computer Assisted Instruction

*One to one interaction

*Greater motivator

*Freedom to experiment with different options

*Instantaneous response/immediate feedback to the answers elicited

*Self-pacing allow students to proceed at their own pace

*Helps teacher can devote more time to individual students

*Privacy helps the shy and slow learner to learns

*Individual attention

*Learn more and more rapidly

*Multimedia helps to understand difficult concepts through multi-sensory approach

*Self-directed learning-students can decide when, where, and what to learn.

Limitations of Computer Assisted Instruction

*May feel overwhelmed by the information and resources available

*Over use of multimedia may divert the attention from the content

*Learning becomes too mechanical

*Non availability of good CAI packages

*Lack of infrastructure.

4.4.2 Computer Managed Learning

Computer Managed Learning (CML) is not to be confused with Computer Assisted Instruction (CAI), Computer Based Instruction (CBI), or Computer Based Learning (CBL). It is however, often referred to as Computer Managed Instruction (CMI).When discussing computers and education, if one remembers that learning and instruction generally refer to the same thing, a good deal of the confusion between different terms is often eliminated.

CMI has both a broad and narrow meaning .In the broader sense, CMI refers to the following definition;

CMI in its most sophisticated levels provides the following instructional functions;

(1) Assesses the learners present level of knowledge

(2) diagnoses weakness in the students learning

(3) prescribes learning activities to remediate the identified weaknesses , and

(4) continuously monitors progress of the learner

CML can save time, money, and bureaucratic headaches, special educators are likely to continue developing and using microcomputer management tools for;

- Storing demographic and educational information on students and their needs
- Recording, monitoring, and reporting students' progress
- Listing incomplete information on student records
- Recording contacts with parents and supporting agencies/personnel
- Recording, monitoring and reporting student due process status
- Generating reports on referrals, meeting, evaluation, placement, programming and review for each student.
- Locating, describing, and recommending appropriate materials based on individual student need
- Generating IEP objectives from a large data base and
- Issuing reminders for when reports are due.

4.4.3 Cybernatics:

Cybernetics is not a new invention but its potential for application has not exhausted even after nearly seventy years of its origin. It started with idea of automation and control in the electrical and mechanical systems, but later on extended to biological, social systems and learning systems.

Cybernetics means 'to steer', 'to navigate' or 'to govern' for taking the system to desired goal. Here in classroom teaching-learning process is a system and the goal is success of the learner and learning process. Classroom cybernetics is constituted by Constructivism, Conversation theory and a feedback system. Constructivism resulted in five E's namely- Engage, Explore, Explain, Elaborate and Evaluate. Conversation theory necessitates interaction between teacher and learner. Feedback is another essential element of cybernetics which is an instrument for controlling the system to maintain equilibrium, move forward or even reverse it.

The aims of Cybernetics divided into three classes as follows:-

1. To construct an effective theory, with or without actual hardware models, such that the various aspects of human and other sorts of behaviour can be simulated.
2. To produce models and theories of human behaviour which present these functions of human beings and other systems in the same manner in which they are performed by human beings or other such systems as are considered. In other words, it is not enough merely to produce the same end result; we want to produce the same end result by similar or even identical means.

3. Finally, to produce, or simulate, the whole of human or animal behaviour by models which in their construction are identical with human beings or animals. That is, they should in the end be chemico-colloidal systems, or protoplasmic systems.

4.4.4 E-Learning

Use of computers and new technologies has become a crucial part of learning as well as teaching. E-learning today has been a key factor in various industries and teaching is one among them; especially teaching language. E-learning has redefined some strategies and concepts of teaching that have enabled the teaching community to perform better.

E-Learning is learning utilizing electronic technologies to access educational curriculum outside of a traditional classroom. In most cases, it refers to a course, program or degree delivered completely online.

There are many terms used to describe learning that is delivered online, via the internet, ranging from Distance Education, to computerized electronic learning, online learning, internet learning and many others. We define eLearning as courses that are specifically delivered via the internet to somewhere other than the classroom where the professor is teaching. It is not a course delivered via a DVD or CD-ROM, video tape or over a television channel. It is interactive in that you can also communicate with your teachers, professors or other students in your class. Sometimes it is delivered live, where you can "electronically" raise your hand and interact in real time and sometimes it is a lecture that has been prerecorded.

What is e-learning? Is it important in education?

When it comes to online learning in education, the model has been pretty straightforward - up until the early 2000s education was in a classroom of students with a teacher who led the process. Physical presence was a no-brainer, and any other type of learning was questionable at best. Then the internet happened, and the rest is history. E-learning is a rapidly growing industry, the effects of which we can trace back to the 1980s and even well before that (in the form of distance learning and televised courses) - these will be discussed later in this ebook.

Now that affordable e-learning solutions exist for both computers and internet, it only takes a good e-learning tool for education to be facilitated from virtually anywhere. Technology has advanced so much that the geographical gap is bridged with the use of tools that make you feel as if you are inside the classroom. E-learning offers the ability to share material in all kinds of formats such as videos, slideshows, word documents

and PDFs. Conducting webinars (live online classes) and communicating with professors via chat and message forums is also an option available to users.

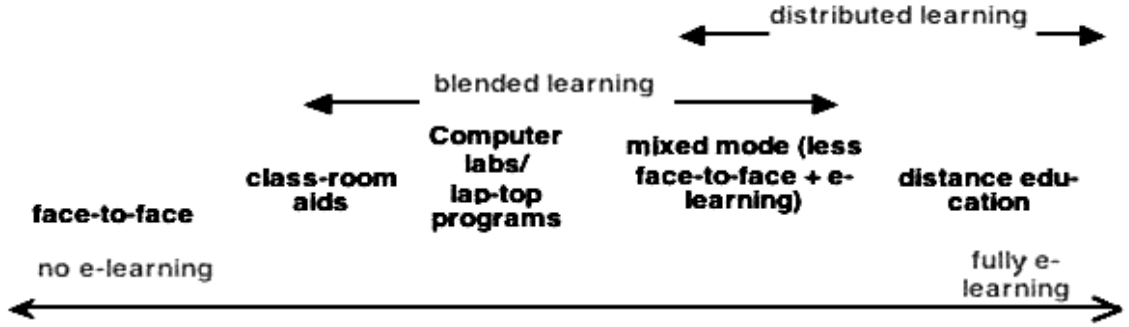
There is a plethora of different e-learning systems (otherwise known as Learning Management Systems, or LMSs for short) and methods, which allow for courses to be delivered. With the right tool various processes can be automated such as a course with set materials and automatically marked tests. E-learning is an affordable (and often free) solution which provides the learners with the ability to fit learning around their lifestyles, effectively allowing even the busiest person to further a career and gain new qualifications.

Some of the most important developments in education have happened since the launch of the internet. These days' learners are well versed in the use of smartphones, text messaging and using the internet so participating in and running an online course has become a simple affair. Message boards, social media and various other means of online communication allow learners to keep in touch and discuss course related matters, whilst providing for a sense of community.

In the fast-paced world of e-learning the available technologies to make a course new and exciting are always changing, and course content can and should be updated quickly to give students the very latest information. This is especially important if the e-learning training is being given to employees in a sector where keeping up-to-date on industry developments is of the utmost importance. This is one of the reasons why many businesses are now offering training via e-learning - other reasons includes low costs and the ability for employees to study in their own time and place.

Overall, traditional learning is expensive, takes a long time and the results can vary. The importance of E-learning is now a given fact and it can offer an alternative that is much faster, cheaper and potentially better.

Figure 1
Different forms of e-learning
(from OECD, 2005 and Bates and Poole, 2003)



The history of e-learning

The term "e-learning" has only been in existence since 1999, when the word was first utilized at a CBT systems seminar. Other words also began to spring up in search of an accurate description such as "online learning" and "virtual learning". However, the principles behind e-learning have been well documented throughout history, and there is even evidence which suggests that early forms of e-learning existed as far back as the 19thcentury.

An e-learning history timeline

Long before the internet was launched, distance courses were being offered to provide students with education on particular subjects or skills. In the 1840?s Isaac Pitman taught his pupils shorthand via correspondence. This form of symbolic writing was designed to improve writing speed and was popular amongst secretaries, journalists, and other individuals who did a great deal of note taking or writing. Pitman, who was a qualified teacher, was sent completed assignments by mail and he would then send his students more work to be finished using the same system.

In 1924, the first testing machine was invented. This device allowed students to tests themselves. Then, in 1954, BF Skinner, a Harvard Professor, invented the "teaching machine", which enabled schools to administer programmed instruction to their students. It wasn't until 1960 however that the first computer based training program was introduced to the world. This computer based training program (or CBT program) was known as PLATO-Programmed Logic for Automated Teaching Operations. It was originally designed for students attending the University of Illinois, but ended up being used in schools throughout the area.

The first online learning systems were really only set up to deliver information to students but as we entered the 70s online learning started to become more interactive. In Britain the Open University was keen to take advantage of e-learning. Their system of education has always been primarily focused on learning at a distance. In the past, course materials were delivered by post and correspondence with tutors was via mail. With the internet the Open University began to offer a wider range of interactive educational experiences as well as faster correspondence with students via email etc.

Online learning today

With the introduction of the computer and internet in the late 20th century, e-learning tools and delivery methods expanded. The first MAC in the 1980?s enabled individuals to have computers in their homes, making it easier for them to learn about particular subjects and develop certain skill sets. Then, in the following decade, virtual learning

environments began to truly thrive, with people gaining access to a wealth of online information and e-learning opportunities.

By the early 90s several schools had been set up that delivered courses online only, making the most of the internet and bringing education to people who wouldn't previously have been able to attend a college due to geographical or time constraints. Technological advancements also helped educational establishments reduce the costs of distance learning, a saving that would also be passed on to the students - helping bring education to a wider audience.

In the 2000?s, businesses began using e-learning to train their employees. New and experienced workers alike now had the opportunity to improve upon their industry knowledge base and expand their skill sets. At home individuals were granted access to programs that offered them the ability to earn online degrees and enrich their lives through expanded knowledge.

The benefits and drawbacks of online learning

Whether you're a high-school teacher looking to engage your students in a more interactive way, or a corporate trainer hired by a large company to design training curricula, e-learning packs a punch when it comes to benefits that make the creation and delivery processes easier and hassle-free. Important benefits are outlined below:

No Boundaries, No Restrictions

Along with locational restrictions, time is one of the issues that learners and teachers both have to face in learning. In the case of face-to-face learning, the location limits attendance to a group of learners who have the ability to participate in the area, and in the case of time, it limits the crowd to those who can attend at a specific time. E-learning, on the other hand, facilitates learning without having to organize when and where everyone who is interested in a course can be present.

More Fun

Designing a course in a way that makes it interactive and fun through the use of multimedia or the more recently developed methods of gamification (further discussed in later chapters) enhances not only your engagement factor, but also the relative lifetime of the course material in question.

Cost Effective

This is directed to both learners and teachers, but there is a good chance that

whatever your role you had to pay exorbitant amounts of money at some point to acquire updated versions of textbooks for school or college. While textbooks often become obsolete after a certain period of time, the need to constantly acquire new editions is not present in e-learning.

It Just Fits!

As companies and organizations adopt technologies to improve the efficiency of day-to-day operations, the use of the internet becomes a necessity. As multinational corporations expand across the globe, the chances of working with people from other countries increases, and training all those parties together is an issue that e-learning successfully addresses. And that's a great advantage of online learning!

Let's blend all of that together and apply it in a real-life scenario:

In an effort to enhance the credibility of course material, oftentimes a professor will summon a field specialist to give a lecture relevant to the topic at hand. In the traditional model of education, the professor would have to extend an invitation to said expert, and incur the costs of his flight, stay and training.

With e-learning:

With e-learning the professor has the ability to host a guest lecture without having to spend much money. It can be done virtually, with cameras for both the lecturer and the students, and with the use of microphones to facilitate the same level of interaction that would be possible if the lecturer were physically present in the room. The added benefit comes in when we are able to replay the lecture and gain even more out of it. Students that missed out can view the recording, or students that attended can watch it again to further their understanding.

Concerns that arise with e-learning

Even given all the benefits of e-learning, one cannot deny there are some drawbacks. A good example of a disadvantage of online learning is that practical skills are somewhat harder to pick up from online resources. For example, although building a wooden table is something you can easily share information about, record videos of and explain, the practical experience is essential. Pottery and car engineering are examples of skills that require hands-on experience.

Isolation

Though e-learning offers ease, flexibility and the ability to remotely access a

classroom in the student's own time, learners may feel a sense of isolation. This is because learning online is a solo act for the most part, which may give the learner the feeling that they are acting completely alone. As technology progresses and e-learning benefits from the advancements being made, learners can now engage more actively with professors or other students using tools such as video conferencing, social media, and discussion forums amongst others.

Health Related Concerns

E-learning requires the use of a computer and other such devices; this means that eyestrain, bad posture and other physical problems may affect the learner. When running an online course it's a good practice to send out guidelines about correct sitting posture, desk height, and recommendations for regular breaks.

4.4.5 Importance of Internet and Websearches in the Modern Education

Things are changing rapidly as the world is progressing. In this modern world people are using advanced machines to do their work. Computer is the most advanced machine that people use to do their work. This particular machine is used in every field of life. Advanced techniques are used with help of computers to diagnose dangerous diseases. Advanced manufacturing techniques are used with the help of computers to manufacture the products. Computers are extensively used in the field of engineering. In past one machine was used to perform only a single task but now-a-days with the help of computers you can perform different tasks at one time. In modern business environment computers have special importance. A huge amount of time is saved due to multitasking. In business terms time is money, so if you are saving time you are saving money as well. Due to multitasking the costs of businesses have reduced. What is the meaning of multitasking? It means that running several programs simultaneously. Since modern computers typically execute instructions several orders of magnitude faster than human perception, it may appear that many programs are running at the same time even though only one is ever executing in any given instant. Multitasking may slow down a computer that is running several programs at one time. Many advanced computers are designed to share their work across many CPUs. This process is called multiprocessing. This technique is generally used in powerful computers such as super computers, mainframe computers and serves. Thus, the entire world is fully dependent on computers. Due to this factor demand of computers has been increased.

Computers have changed the way we work, be it any profession. Therefore, it is only but natural the role of computers in education has been given a lot of prominence in the recent years. Computers play a vital role in every field.

Importance of Educational Websites

In this technology era, the passion of internet is boosting among the students. For any search they usually like to use the Google to collect the information. Similarly in the case of education, it is often helpful to use education websites as a means of collecting the relevant information about the concerned subject. Well, it has become very necessary for any new business to promote over the web. If we want to put up and enlarge your business in worldwide then it's vital for you to make a good web site, so that people can easily understands the mission and vision of your business and liberally enjoy the various services.

Today the many institutes and colleges in India are developing their own sites to offer the clear concepts to the students. With the help of these education websites student can search any colleges across the country just by entering the few relevant keywords like best law colleges in India, medical colleges in India. It is well said "Action Speaks Louder than Words"; in the same way education website will speak volume for students.

At present there are some great education websites are available which directly conveys the useful information. Suppose you want to find the list of best law colleges in India these education websites help you out and shows the all best law colleges in India in the form of list even it can also mentioned the complete details of the colleges including courses offered, fee details, duration of the course and contact details of the colleges.

The concept of education websites is still new in India but owing to its growing need, it is gaining popularity at a fast pace. Students have become more conscious about their career so that picking right course is necessary as it is the merely way that ensures their good professional life. In this regard, they visit education websites and openly discuss their areas of interest and seek all significant info. Students also visit these education websites to get the information about the various college or institute; they want to take admission in like medical colleges in India.

These education websites are especially best for those students who live in the remote areas and don't able to reach the colleges. They can add their request by mailing these education websites and fetch the instant responses.

4.5 Disability Friendly Technology - Punarjani and E-Learning Framework Developed by C-DAC

4.5.1 Punarjani:

Punarjani is an assessment tool for the children with Intellectual disabilities. CDAC

Trivandrum is engaged in developing an assessment tool named Punarjani.The system will collect a lot of data about a particular child with intellectual disabilities like developmental history, school history, home environment, social environment etc. and will be capable of suggesting a long term goal for the child.

This is an assessment tool for teachers who work with children with intellectual disabilities. This tool frees the teacher from time consuming activities likepreparing reports.

Doing manual assessment etc. and thus gives the teachermore time with the children. The teachercan override the assessment datagenerated by Punarjani but then has to give sufficient reasons why the result has been overridden. The software has built in learning capability based on the teacher's input.

4.5.2 E-Learning Framework developed by C-DAC

Centre for Development of Advanced Computing (C-DAC) is the premier R&D organization of the Ministry of Electronics and Information Technology (MeitY) for carrying out R&D in IT, Electronics and associated areas. Different areas of C-DAC, had originated at different times, many of which came out as a result of identification of opportunities.

- The setting up of C-DAC in 1988 itself was to built Supercomputers in context of denial of import of Supercomputers by USA. Since then C-DAC has been undertaking building of multiple generations of Supercomputer starting from PARAM with 1 GF in 1988.
- Almost at the same time, C-DAC started building Indian Language Computing Solutions with setting up of GIST group (Graphics and Intelligence based Script Technology); National Centre for Software Technology (NCST) set up in 1985 had also initiated work in Indian Language Computing around the same period.
- Electronic Research and Development Centre of India (ER&DCI) with various constituents starting as adjunct entities of various State Electronic Corporations had been brought under the hold of Department of Electronics and Telecommunications (now MeitY) in around 1988. They were focusing on various aspects of applied electronics, technology and applications.
- With the passage of time as a result of creative echo system that got set up in C-DAC, more areas such as Health Informatics, etc., got created; while right from the beginning the focus of NCST was on Software Technologies; similarly C-DAC started its education & training activities in 1994 as a spin-off with the passage

of time, it grew to a large efforts to meet the growing needs of Indian Industry for finishing schools.

C-DAC has today emerged as a premier R&D organization in IT&E (Information Technologies and Electronics) in the country working on strengthening national technological capabilities in the context of global developments in the field and responding to change in the market need in selected foundation areas. In that process, C-DAC represents a unique facet working in close junction with MeitY to realize nation's policy and pragmatic interventions and initiatives in Information Technology. As an institution for high-end Research and Development (R&D), C-DAC has been at the forefront of the Information Technology (IT) revolution, constantly building capacities in emerging/enabling technologies and innovating and leveraging its expertise, caliber, skill sets to develop and deploy IT products and solutions for different sectors of the economy, as per the mandate of its parent, the Ministry of Electronics and Information Technology, Ministry of Communications and Information Technology, Government of India and other stakeholders including funding agencies, collaborators, users and the market-place.

C-DAC has developed a number of indigenous solutions for content management, evaluation and assessment, virtual classroom, collaboration for e-learning domain. Some of the solutions are listed below.

- e-Shikshak is a learning management system with rich support for Indian languages.
- National Online Examination System (NOES) is an examination system primarily aimed at conducting recruitment.
- Online Labs (Olabs) for school lab experiments provides students with the ease and convenience of conducting experiments over the Internet.
- Veda is a general purpose online testing and question banking system, primarily supporting multiple choice questions (including its variant forms such as match the following).
- Video conferencing solutions for building virtual classrooms supporting synchronous lectures are also available from C-DAC.
- e-Saadhya (SaralAnukulaneyAdhyayan) an Adaptable and Accessible e-Learning framework for the children with mild mental retardation and Autism, is being developed with the domain support from National Institute for the Mentally Handicapped (NIMH) with local language support in three Indian languages Hindi, Telugu and Kannada.

- An Academic Networking portal for the faculty members, students, and academic institutions to network and share information about courses, academic events, projects, etc. has been created through a portal called SEEKHA (www.seekha.in)

e-Sikshak - Learning Management System

Salient features of e-Sikshak:

1. Course Organizer
    1. Support for 3-level course organization with a hierarchy of Course, Module and lesson
    2. Create and modify courses
    3. Course Reports
2. Online Assessment
    1. Question bank creation
    2. Multiple-choice single answers
    3. Multiple-choice multiple answers
    4. True or False questions
    5. Uploading of assignments by instructor
    6. Uploading solutions by student
    7. Student performance reports
3. Whiteboard
    1. Synchronous communication between student and instructor
    2. Graphical interface to simulate real world Whiteboard
    3. Facilitates drawings with color; all drawing tools like rectangle, circle, free-hand etc.
    4. Text with desired color font etc
    5. Shared discussion area between student and instructor
4. Bulletin board
    1. Creates forums for subject discussions
    2. Thread based discussions
    3. Search

5. Chat
    1. Real-time communication between instructor and learner
    2. Public chat between student and instructor
    3. Blocking/unblocking chat users by the instructor
6. e-Mail
    1. Asynchronous communication tool
    2. Facilitates offline interaction with instructor or among the student community
    3. Attachment facility
7. User Management
    1. Portal efficiently handles user management in successful implementation of the course. The different users involved are :

1. Administrator Can
    - Manage users
    - Create and update courses
    - Assigns learners to the courses
2. Instructor Can
    - Upload course material
    - Maintain question bank
    - Evaluate assignments
    - Activate discussion forums
3. Learner Can
    - Register into multiple courses
    - Access course material and download
    - Get the performance report
    - Take online test

e-Sikshak is a Multi-lingual e-Learning framework

Features:

1. Unicode based multilingual solution

2. Customizable Graphical User Interface
3. Supports multi media content
4. Portable to mySQL and Oracle
5. Servlet based serve side technology

e-Sikshak is right now used by :

1. Information Security and Education- CDAC Hyderabad
2. Indian Law Institute- New Delhi
3. National Institute Of Agricultural Extension Management- Hyderabad
4. India Development Gateway - CDAC Hyderabad.
5. Two online cources are being offered by CDAC Hyderabad on esikshak portal (www.esikshak.in)
   - Core Competency in Software Process Management [CCSPM]
   - Certificate Course on Cyber Security [CCCS]
   - C-DAC Certified Cyber Security Professional [CCCSP]
   - C-DAC's Certified Professional in Linux System Programming [CCP-LSP]
   - C-DAC's Certified Professional in Linux Kernel Programming & Device Drivers [CCP-LKPDD

National Online Examination System

National Online Examination System (NOES) is a robust, fault tolerant, secure and scalable examination system through which examinations can be delivered on an "on demand" basis in selected examination centers spread across the country.

The system can be used by educational institutes and organizations for registration, examination and multi-level interviews.

Architecture

The system has been developed using Adobe Flex, Spring, and Hibernate framework and is highly secure and fail safe. It utilizes the following framework across its various tiers namely Adobe Flex at the Presentation tier, Blaze DS at the Remoting tier, Spring at the Business tier, Hibernate at the Object Relational Mapping tier and Terracotta for providing JVM Level Clustering for high availability and better throughput.

Functionality

The main functionalities provided by the system include:

- Online Registration Process through which candidates can provide their demographic details, choose their examinations, select exam slot timings and make payments (either through payment gateway or demand drafts)
- Question Entry and Verification system through which questions can be entered under various subject headings and subsequent verification of those questions.
- Exam Administration which provides the facility for creating examination, generation of question paper, result generation etc.
- Exam Conduct system which presents the question paper to the candidate and captures the response submitted by the candidate. It supports both static and adaptive mode of examination.
- Interview Conduct process comprising of Interviewer & Interview controller module. Interviewer module is used by interviewer for grading an eligible candidate. Interview controller module is used for assigning the candidate to a particular Interview Panel.

Salient Features:

- Authorized user based access control.
- Online registration process with provision of exam scheduling and making payment (either through payment gateway or demand draft.
- Automatic generation of admit cards.
- Automatic generation of question paper by the system using input criteria like subject, number of questions and difficulty level.
- System provides end to end security as question papers are encrypted.
- AIR sandbox environment for the examination screen.
- Highly fail safe with the ability to resume exam on the last saved state.

- Supports both static and adaptive modes of examination.
- Multi-level interview process
- Immediate result generation.

MySikshak (personalized e-Learning framework)

MySikshak (personalized e-Learning framework) which extends the learning environment with personalized e-Learning services assisted by instructor through web. It mainly focuses on needs and aspirations of individual learners. This model recognizes that every student is an individual, with a distinct learning style, learning pace, learning path, and learning aspiration. It is also dedicated for building individualized learning programs whose intent is to engage learner continuously in the learning process in the most productive way to optimize learner's learning potential and success

Salient Features

- Interoperable Services
- Standards Compliant
- User interface with rich interaction
- Intelligent filter mechanism to group the learners
- Collaborative activity/course building environment for Instructors
- User interface with rich interaction
- Platform independent

Services provided by MySikshak:

User Registration

- Online registration
- Updating user profile
- Necessary user reports for instructor and learner
- Provides the learning style
- Request for a course

Course Organizer

- Add and Delete courses
- Folder hierarchy based conversion into SCORM compliant standard course

- Collaboration among the instructor to upload the content into the course Learners' Information in dashboard
- Dashboard provides assistance to instructor in analyzing the learning styles of the student cluster
- Cluster management tool provides the facility of creating/deleting/ modifying the student clusters and their corresponding characteristics

Learning Path Editor

- Provides facility to instructor to design the SCORM compliant learning path template based on learner's prior knowledge and learning style
- Provision for instructor/expert to add and modify the e-Learning activities like quizzes, examples and/or case studies within template, specific to the group identified
- Leads to the creation of personalized learning path template comprising of learning content and activities

Personalized Content and Activity Delivery

- Takes the SCORM compliant learning path template assigned for learners
- Use Run Time Environment (RTE), to deliver and track the learners' activities according to SCORM complaint learning path template

Adaptive Assessment

- Pre, Formative and Summative Assessments
- Formative assessment using Computerized Adaptive Testing (CAT)
- Summative assessment using Computerized Classification Testing (CCT)
- æþQuestion Repository conforming to standards (IMS QTI)

Query Handler with semantic web technology

- Query Handler capable of semantically identifying the queries and supervised with expert rating mechanism
- Ontology editor provides facility to create subject specific ontologies with help of experts

- Provides assistance to instructors for replying the queries with additional multimedia support from web.

4.6 Devolping Technology Integrated Lessons- Individual And Group

When technology integration in the classroom is seamless and thoughtful, students not only become more engaged, they begin to take more control over their own learning, too. Effective tech integration changes classroom dynamics, encouraging student-centered project-based learning.

The first step in successful tech integration is recognizing the change that may need to happen inside of yourself and in your approach to teaching. When any teacher brings technology into the classroom, he or she will no longer be the center of attention. The level of refocused attention will, of course, depend on the amount and the type of technology (e.g., mobile device, e-reader, laptop, interactive whiteboard) being brought into the classroom. However, this does not mean that the teacher is no longer essential to the learning process. While students may be surrounded by technology at home, it is dangerous to assume that they know how to use it for learning -- this is commonly referred to as the "myth of the digital native,"

Lesson Development Using Technology

Lesson development refers to all the activities that teachers do as they create, teach, and evaluate lessons with students. Lesson development involves a teacher's decisions about three interrelated elements of teaching lessons:

- Academic content (what to teach)
- Teaching goals, methods, and procedures (how to teach)
- Learning assessments (how to know what students have learned)

Lesson development using technology involves how teachers use electronic resources to facilitate these processes.

Academic Content (What to Teach)

Every time they teach, teachers make choices about academic content-the facts, concepts, ideas, skills, and understandings they intend to share with students. Clearly, school system guidelines and state and national curriculum frameworks define and in some cases mandate "what to teach." Lesson development must be connected to local curriculum frameworks, which are aligned to state and national standards. However, because no local

curriculum or national standard spells out everything to teach about any given topic, classroom teachers must make choices about what will be explored or explained to students each day. Technology plays an essential role in assisting teachers to answer the academic content or "what to teach" question. Digital content available on the Internet includes a vast collection of curriculum resources and information. Using Internet search engines, electronic databases, online encyclopedias, blogs, wikis, and other technology tools, teachers and students have access to powerful new ways to research and retrieve information.

Teaching Goals, Methods, and Procedures (How to Teach)

As they answer the "what to teach" question, teachers simultaneously decide the teaching goals, methods, and procedures they will use in their classes. Goals are the reason why a lesson is being taught. Methods are the instructional strategies-large groups or small groups, discussions, lectures, role-plays, simulations, case studies, inquiry-based activities, creative writing, learning and reflection journals, drill and practice exercises, online tutors, or learning games-that teachers use to convey academic content to students. Procedures are the scheduling and grouping of students by teachers during a lesson, including how much time each activity has allotted to it. Teachers combine goals, methods, and procedures into formats for daily learning. Sometimes curriculum content dictates these processes; sometimes the goals, methods, and procedures dictate the choice of content. Either way, content, goals, methods, and procedures mutually support each other in a dynamic process of lesson development, which technology can support in a variety of ways, such as the following:

- Presentation software
- Visual thinking software
- Web-based diagram- and flowchart-making tools
- Teacher-developed websites
- Threaded discussions and email
- Web Quests
- Intelligent tutoring systems
- Digital cameras and movie-making software
- Assistive technologies

Learning Assessments (Knowing What Students Have Learned)

Learning assessments occur before, during, and after teaching lessons and enable teachers

to evaluate student knowledge, understanding, and performance. They can be summative (summarizing what students have learned at the end of a lesson), formative (happening as a lesson unfolds), or diagnostic (preceding a lesson as a way to measure what students already know) (McTighe& O'Connor, 2005). Assessment tools include multiple-choice and short answer tests, essays and other written tasks, oral discussions, teacher observations, class participation, and student projects, portfolios, and performances, all of which provide evidence of what students have learned and are able to do as a result of the teaching. Technology tools that support the assessment and evaluation process include

- Electronic tests and quizzes
- Digital portfolios
- Personal response systems
- Online surveys
- Online evaluation rubrics

When technology integration in the classroom is seamless and thoughtful, students not only become more engaged, they begin to take more control over their own learning, too. Effective tech integration changes classroom dynamics, encouraging student learning.

4.7 Implications of Technology Based Instruction In Inclusion

Inclusion or integration is an important part of equal opportunity in education. Demands for inclusive education have increased and fostered major changes to schooling and education. Students with disabilities are educated alongside their peers within the local community therefore mainstream schools are required to adapt to accommodate a diverse group of students with a variety of needs (O'Gorman, 2005, p. 377). Approaches to the inclusion of children and young people into mainstream classrooms, and the identification and recognition of special educational needs, is an integral part of daily school work. The wellbeing and actualization of developmental and learning potential within a diverse student population is challenging the organization of learning settings.

Educational Technology for Inclusive Classroom: Integrating Technology into Instruction in an Inclusive Classroom for Diverse Learners is a welcome step to overcome the challenges. Inclusive Education is based on the concept of multiple intelligence and

individual difference. There is evidence to say that all individuals are different from each other and no two individuals can completely alike even if they have been brought up in the same environment. Teachers should also realize that having high scholastic ability is not the only measure of child's intelligence. What is important is to develop flexible student centered pedagogy capable of educating all students, including those who are disabled or disadvantaged. In an inclusive setting we expect greater participation of students with special educational needs in the culture and curricula of mainstream schools. In this context we have to think of some techniques that permit all students who are different from each other to learn together in the same classroom. Major Teaching Strategies: To make inclusive education a success and to teach students having diverse abilities in the same class the following teaching strategies may be used:

1. Use of Multimedia and computer assisted instruction
2. Team teaching
3. Cooperative learning

1. Use of Multimedia and computer assisted instruction One major factor to enhance learning in the inclusive classroom is the use of technology. Technology provides ways for children with disability to communicate and interact on a more equal level with other children. Adaptive technologies can open a new world to children with physical limitations and therefore children often feel better about themselves as active learners. Computer programmes can be individualized and automatically adjusted to the student's instructional level. This is more evident in the case of individuals with hearing and vision impairment. Multimedia approach of instruction (audio, video, graphics, internet, animations etc.) is essential for effective and efficient learning because in any learning situation, the more the senses are stimulated, the more the person learns and the longer he retains. Multimedia in the classroom also includes Power Point presentations that are created by the teachers. Multimedia activities encourage students to work in groups, express their knowledge in multiple ways, solve problems, revise their own work, and construct knowledge. The advantages of integrating multimedia in the classroom are many. Through participation in multimedia activities, students can learn:

- Real-world skills related to technology
- The value of teamwork

" Effective collaboration techniques

- The impact and importance of different media
- How to present information in convincing ways
- Techniques for synthesizing and analyzing complex content
- The importance of research, planning, and organization skills
- The significance of presentation and speaking skills
- How to accept and provide constructive feedback
- How to express their ideas creatively

2. Team Teaching:

The special education teacher may brief the regular teacher on the IEP (Individual Educational Plan) of the learning disabled students. The two teachers can develop instructional plans and worksheets weekly. They share the task of grading student worksheets. In actual practice, the regular education teacher assumed most of the responsibility for the overall instruction and classroom management while the special education teacher give individual support to both special and regular students. Throughout the year the two teachers can refine their team teaching skills and can become a finely tuned instrument of education serving all the students in an enhanced classroom organization. For eg.if a blind student writes his/ her answer in Braille the general teacher may require the help of specialist to correct the answers.

2. Cooperative Learning:

A working definition of Cooperative Learning is the use of small groups through which students work together to maximize their own and each other's learning. In cooperative learning, students work with their peers to accomplish a shared or common goal. The goal is reached through interdependence among all group members rather than working alone. Each member is responsible for the outcome of the shared goal. Cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other's learning (Johnson & Johnson, 1989). Cooperative learning makes sense in inclusive classrooms because it builds upon heterogeneity and formalizes and encourages peer support and connection. However, cooperative learning is not of value only to children with disabilities, it is equally important for the normal children. Important skills such as critical thinking, creative problem solving, and the synthesis of knowledge can easily be accomplished through cooperative group activities

in inclusive classrooms. Not only can students get to know each other's abilities within a cooperative process, but teachers can as well. A general education teacher and a special education teacher planning together often find that they have unique skills and ideas to contribute to the process. The general education teacher may have a broader perspective on the curriculum and on curriculum integration, whereas the special education teacher may have special skills in modifying instruction and developing adaptations that benefit many children. General education teachers who are used to working with larger groups of children often can contribute important classroom management and organizational strategies to balance some of the individualized approaches proposed by the special education teacher. Cooperative learning is a strategy used by group/ number of students to achieve a common goal with mutual collaboration and support. In cooperative learning groups, students have two responsibilities:

1. To learn the assigned material
2. To make sure all other members do likewise.

When learning situations are structured cooperatively, regular and special education students can work together in pairs or teams to accomplish their common goals.

4. Peer -tutoring:

This involves one-to-one instruction from one student in the tutoring role to another student. In this method, students teach each other on one-to-one basis. Peer is defined as the individual of the same social gathering. For example, in a class a fellow student would be a peer. Therefore, when a student from the same class provides instruction to another student of the class the technique is called peer-tutoring. Sometimes peer tutoring may prove to be quite effective and both the student and the peer tutor may gain from the process.

The push for technology in the classroom is not a new initiative. In the past there have been many attempts to incorporate technology in the classroom. In some cases school districts did not have funding to support technology while in others schools with technology and resources do not have the personnel and the know how to implement it effectively. In some cases teachers are not provided with the support needed to successfully integrate technology into the classrooms. In today's ever changing world, technology has found its way into every facet of our lives. The internet, mobile devices, you tube videos, social networking, I-pads and android all comprise the world our students are living and learning in. As educators, we must be able to embed this

technology into our practices and allow our children to benefit from these technological advances. Although this may seem like a difficult venture it really isn't. The reality is that most kids do not need instruction on how to operate a computer; we instead need to focus on learning how to teach content with and through technology.

Teachers need to understand how technology can benefit student learning. Technology can allow a teacher to access each and every child's individual learning style while providing a platform where students can work at their own pace. Technology can help teachers balance the limited instruction time by providing activities, project-based learning, and one-on-one coaching and peer support all while making learning interactive and fun. Well employed use of technology in the classroom can allow teachers to tailor learning to students' individual needs while freeing up classroom time, leaving teachers more time for projects, one-on-one coaching, and more creative activities.

4.8 Let Us Sum Up

Today's generation of students are growing up in a digital world. Using digital devices is a huge part of their everyday experience out of school. Through Google they have access to a wide wealth of digital information, content and resources.

With all of this so intrinsic to their 'outside school' experience, the challenge for the teaching profession is how to harness all this for learning within the classroom and at home. This generation of 'digital natives' has much lower need for libraries of physical content for example, the traditional resource used by students half a generation ago. Learning styles are changing and teachers need to adapt their teaching styles accordingly.

One crucial question is will this new technology actually improve education? The impact of ICT on learning outcomes has been inconclusive, billions of pounds/euros spent - but is generally difficult to evaluate effectiveness in terms of improved results. Nonetheless there are outcomes that are conclusive, and which indirectly impact on learning outcomes. These include improvements in:

- Engagement
- Motivation
- Independent learning
- Parental engagement
- Student and staff attendance and punctuality
- Extending the children's learning time

With the change in learning styles, the role of the teacher is changing too; as well as being a presenter of lesson material; they also assume the role of facilitator/coach in an increasingly collaborative learning environment.

These two key styles of learning; presenting and collaborating; link directly to some of the different types of technology employed in the classroom. Interactive White Boards have been the base of the presenting style of learning, where the teacher is at front of class, and all students are involved in interactive learning.

For the more personalized learning, laptops, netbooks and tablets are increasingly pervasive in the classroom. Globally 2% of students have a mobile computing device supplied by the school, forecast to increase to 7% by 2016.

The crucial point is that the teacher will still want and need to be in charge of the classroom, they may decide to let students use technology for some parts of a lesson but they will still want to be the centre-point of attention and control. This may be at the front of the classroom or, as is becoming more relevant, to be able to move around the classroom and still remain in control. In these styles of classroom environment clearly the ability of devices to talk to each other ie the seamless connectivity between student tablets and front-of-class display, becomes increasingly key.

Currently 13% of the 34 million classrooms globally have an interactive display, leaving a massive 87% without

Individual 1:1 teaching equipment is not new, in its most basic format many schools use small simple hand-held whiteboards for children to write on, allowing each to write an answer or create a picture which can be held up for the teacher or class to see.

The first individual student communication technology was the voting system, allowing each student to answer questions which could then be automatically collated and attributed to them. Teachers would often start the lesson with a couple of short questions to assess understanding of the previous lesson and if they needed to go back and recap - much more precise then just a show of hands. However mobile PCs (laptops, netbooks, tablets) truly unleash the full potential of 1:1 learning, allowing a fully personalised learning experience for each student.

The concept of the "Flipped Classroom" is a method of teaching which is turning the traditional classroom on its head. Students do not need a teacher there when they are just viewing a lecture which can be done at home, perhaps by watching a video created by the teacher, or when they are completing an assignment.

Teachers do need to be present to help understand issues and work through problems and answer questions. The teacher then becomes a facilitator, tutor or guide and can spend more time one on one with the students. Teachers are finding that they can start to introduce this concept and slowly build on it and does not need to start as a complete radical change

The transition to digital within education is leading to a raft of new exciting opportunities for education. The key factors for schools when considering technology investments are:

- Carefully consider technology investments in the context of their impact on pedagogy
- A need for a clear vision as to how the devices would be utilised and add value to the learning experience.
- Some concepts can be introduced, and slowly built on, without having to start with a complete radical change e.g. the flipped classroom.
- Take a broad approach to investment, considering both presentation style and collaborative style learning, and how the relevant devices communicate and interconnect.
- Consider the student's holistic learning experience, both in-class and at home and how these can feed into each other.
- Recognise the impact on teachers and the amount of training that will be needed to maximise the benefit of the technology.

4.9 Check Your Progress

1. Prepare a poster on Technology and Inclusion.
2. Comment on the recent trends in Technology for teaching and learning.
3. Compare technology integrated lesson with conventional method of teaching.
4. Develop technology supported lesson plans for PwID

4.10 References for further Readings

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Unit - 5: Application of Technology

Structure

5.1 Introduction

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The crucial point is that the teacher will still want and need to be in charge of the classroom, they may decide to let students use technology for some parts of a lesson but

they will still want to be the centre-point of attention and control. This may be at the front of the classroom or, as is becoming more relevant, to be able to move around the classroom and still remain in control. In these styles of classroom environment clearly the ability of devices to talk to each other ie the seamless connectivity between student tablets and front-of-class display, becomes increasingly key.

Technology in education plays an important role in improving the educational skills and knowledge of the people. This is very important especially those who need improve their knowledge in order for them to achieve a successful life in the future. Technology in education is manifested through the use of computers. This is also a great help for teachers since they can already enhance their teaching skills and strategies every time they are facing their class. This technology is very essential for both the students and the teacher but there are some instances wherein this technology is seen to be disadvantageous for both of them as well.

Information technology in education has improved and has also brought about an easy access to different learning resources. They help to improve teaching skills and learning abilities of students. These learning resources include audio and visual education. Students are taught with projectors in classrooms or lectured through class speakers. Students and teachers can also easily download eBooks from the internet which can be read from anywhere through your phone or tablet.

4.2 Objectives

After going through this unit you will be able to

- discuss about application of technology in lesson planning, worksheet preparation, report writing and evaluation.
- discuss about the assistive devices.
- discuss about the advantages and disadvantages of technology.
- discuss the implications of technology in Inclusion

5.3 Application of Technology in Lesson Planning, Worksheet Preparation, Report Writing and Evaluation.

5.3.1 Technology and Classroom Learning

Technology integration is an important way to create meaningful learning experiences.

Lesson planning for teachers can be overwhelming when incorporating the use of computers in activities.

Technology has revolutionized the way humans interact and connect with each other, and modern classrooms, homes, and offices are drastically different from how they were just 20 or 30 years ago. Students today need to prepare for a workplace more exposed than ever to social media, television, video games, and other technological advancements. By bringing technology into the classroom, teachers help prepare students to handle the professional world of the future. Here are seven ways teachers can leverage the Internet and other technologies to enhance classroom learning.

1. The amount of information available

When using the Internet, teachers and their students have the opportunity to access seemingly limitless information. School projects are no longer confined to the reach of textbooks within their local libraries. Students can use Google to learn more about topics in far less time. Teachers can use the information students have at their fingertips to challenge them and encourage them to delve deeper into subjects and master the information.

2. The modern languages opportunities

Modern language skills are extremely valuable in the professional world. Allowing students to communicate with native speakers of that language is just one of the uses of technology in education. Students are able to hear the language, practice speaking skills, and enhance their overall understanding.

3. The chance to learn geography, history, and culture

With a world that is increasingly defined by global trade and intercommunication, the opportunity to meet and speak with students in other countries is a valuable experience in itself. Geography, international history, languages, and cultures take on a much greater meaning when students can interact with people from that country rather than just learn about them in a textbook. Students can interview other children about their local customs and cultures to get first hand experiences.

4. Access to new norms of education

Large classrooms with disproportionate student-to-teacher ratios make it challenging for a teacher to give individualized attention to each student. While the Internet is not a substitute for personal interaction, it does offer a wide range of resources for teachers to use to help some students gain understanding of the material. There are study guides, interactive diagrams, explanations, and videos all available on the Internet.

The Internet can be extremely helpful for students who have different learning styles. There may be some who will learn a subject the best when they can read the material, taking time to digest it. Others may learn better through videos or interactive instruction. These methods can all be taught simultaneously through the Internet.

5. Individualized lessons

With the Internet, not only will students have the opportunity to study using their preferred means of learning, they will also be able to better set the pace. In every classroom there are some students who grasp material quickly and become bored with subsequent repetition. On the other hand, there are students struggling to keep up. Technology can help teachers create lessons that will allow the quickly moving students to delve deeper into the subject or explore related topics while allowing the slower students more time to understand the material.

6. Adding new meaning to student projects

Students enjoy finding meaning to their work. While in the past they could create reports and projects that would be viewed only by their teacher and fellow students, their work can now be easily displayed online. They can create materials to be used by other students and get feedback on their ideas from students in other schools all over the world. This will help students take pride in their work and find meaning in their assignments.

7. Student collaboration opportunities

Along the same lines, students can collaborate on projects with students from around the world. They can work with students from the school across the street or across the country. There is a full range of technology, such as the recent popularity in cloud technology, which will allow the students to speak and work together with ease without ever meeting in person.

Technology presents teachers the opportunity to open doors for their students. They have access to limitless information and students are better prepared to enter the workforce because integrating technology into their educational lives better prepares them for the global world

5.3.2 Technology Integration Lesson Planning Process

When designing computer-based activities, you must give consideration to how technology can be used to acquire, organize, demonstrate, and communicate information. The planning process for technology integration is similar to planning a curriculum unit. The main differences are HOW the students acquire the knowledge and skills,

HOW they demonstrate and apply the knowledge and skills, and HOW learning will be assessed or evaluated. These differences have a major influence on the structure of a lesson plan as they incorporate the use of the computer.

In addition to the skills and knowledge that must be taught as part of the curriculum, consideration must also be given to the technology skills students need to learn. Often teachers assume that the students will figure it out on their own. However, this can waste instructional time. It is a good idea to plan ahead, so that the time in the computer lab is well spent.

Step 1: Examine Curriculum Documents

- select the topic
- identify learning objectives within a subject

Step 2: Determine Knowledge and Skills

- determine students' background knowledge and existing technology skills
- decide how students will acquire new knowledge and skills
- gather resources required to achieve instructional goals

Step 3: Select a Technology Product to Apply Learning

- choose a technology-based product for students to create
- outline the content it will contain
- select the software program(s) needed
- list the technology skills required to complete the task

Step 4: Select a Method of Assessment and Criteria for Evaluation

- determine the method of assessment
- set the criteria to evaluate the technology product with a focus upon content, quality of information, layout and design, and technology skills demonstrated.

5.3.3 Assistive Technology Tools & Resources for Students with Disabilities

One tool to help students with disabilities even in the face of a special education teacher shortage is assistive technology. Today, assistive technology can help students with certain disabilities learn more effectively. Ranging in sophistication from "low" technologies such as a graphic organizer worksheet to "high" technologies including cutting-edge software and smartphone apps, assistive technology is a growing and

dynamic field. Several areas of assistive technology and sample products may be found in any given classroom, making a difference in how students of all abilities learn.

Text-To-Speech Assistive Tools

As an assistive technology, text-to-speech (TTS) software is designed to help children who have difficulties reading standard print. Common print disabilities can include blindness, dyslexia or any type of visual impairment, learning disability or other physical condition that impedes the ability to read. However, other students can benefit from TTS technology, such as children that have autism, attention deficit hyperactivity disorder (ADHD) or an intellectual disability.

The technology works by scanning and then reading the words to the student in a synthesized voice, using a large number of speech sounds that make up words in any given context. With the advances in speech synthesis, TTS technology is more accurate and lifelike than ever.

Intel Reader

The Intel Reader is a mobile handheld device that uses TTS technology to read printed text aloud. It features a high-resolution camera that captures printed text, converts it to digital text and reads it to the user. During playback, words are highlighted as they are read aloud, and the user can pause and have the device spell out highlighted words. The available Intel Portable Capture Station functions as a stand for the Intel Reader to easily and quickly capture text from books and other documents.

At about the size and weight of a paperback book, the Intel Reader is mobile enough to use in any environment. Students can also transfer content from a home computer, or save generated audio versions of printed materials to a computer. Available voices vary in gender, pitch and speed.

Kurzweil 3000

The Kurzweil 3000 is a leader in TTS software for individuals that struggle with literacy. In addition to a range of TTS features, the full-featured software program integrates abilities that can help students in other areas, potentially appealing to those who may have a non-print disability or those who may not typically consider a TTS program. Some of the features include:

- Multiple TTS voices
- Support for 18 languages and dialects
- Talking spell-checker

- Picture dictionary graphics for more than 40,000 words
- Text magnification
- Tools for test taking, essay writing, note taking, reference and more

The Kurzweil 3000 strives to provide students with a multi-sensory approach to literacy learning. It is available for Windows and Macintosh.

Graphic organizers can be effective in helping students to organize their thoughts during the writing process. As an assistive technology, graphic organizers can be a strong choice for students with dysgraphia or disorders of written expressions - particularly the conceptual aspects of writing.

Graphic organizers work by helping the student map out a course of action. Depending on the type of writing, the graphic organizer can prompt the writer to describe an object, chart out a course of events or perform some other task that can help in planning the piece. Graphic organizers vary by type and technological sophistication.

Low-Tech Handouts

Graphic organizers do not need to be technologically advanced; in fact, they can exist in simple handout form.

Sample handouts can be found at the Houghton Mifflin Harcourt Company. The sandwich chart can assist students with paragraph writing. The sequence chart can help with narrative writing and the ordering of events. The sense chart is designed for descriptive writing, where writers are prompted for terms that characterize and express an item. Dozens of other sample charts exist and can help students with virtually any type of writing.

Draft:Builder

Draft:Builder is a writing tool that integrates outlining, note taking and draft writing functions to break down the writing process into three steps. Using a graphical organizer, the program helps the student visualize the project and insert information into the appropriate place without having to conceptualize the whole process. It then automates the process of creating the paper, where the student can drag and drop what is written in each note to the rough draft.

Other features include a talking spell checker that uses TTS technology, a bibliography tool, a dictionary and the ability for teachers to add locked text into the program for further guidance. Draft:Builder is available for Windows and Macintosh.

Assistive Listening Systems

A variety of assistive listening systems, or hearing assistive technology, can help students who are deaf or hard of hearing, as well as those with other auditory and learning problems. According to the National Association for the Deaf, assistive listening systems can be used to enhance the reach and effectiveness of hearing aids and cochlear implants, or by children who do not need those tools but still need help hearing. Assistive listening systems use a microphone, a type of transmission technology and a device for capturing and bringing the sound to the ear. The specific transmission technology used in the system is typically what contrasts one type of assistive listening system from another.

FM Systems

According to the American Speech-Language-Hearing Association (ASHA), FM systems are the best choice for children with sensorineural hearing loss. The most common type of hearing loss for all ages, sensorineural hearing loss occurs when the inner ear (cochlea) or nerve pathways from the inner ear to the brain are damaged.

FM systems work using radio broadcast technology. With a transmitter microphone and a receiver, the teacher and student can maintain a consistent sound level regardless of distance and background noise. Additionally, ASHA notes that the hearing aid microphone can be turned off, so the student can concentrate on the teacher alone.

Sound-Field Systems

Sound-field systems are a strong choice for classrooms that need to assist listening for all children in the class. ASHA notes that these systems benefit not only children that have hearing loss, but those that have other auditory and learning problems, such as language delays, central auditory processing disorder, articulation disorders and development delays. Additionally, sound-field systems can be used for students who are learning English as a second language.

Sound-field systems use a microphone that projects sound through mounted speakers around the classroom. In classrooms that have good acoustics, sound is able to travel evenly throughout space, eliminating problems of distance between the speaker and each listener.

Sip-and-Puff Systems

Sip-and-puff systems are used by students who have mobility challenges, such as paralysis and fine motor skill disabilities. These systems allow for control of a computer, mobile device or some other technological application by the child moving the device

with his or her mouth. Similar to a joystick, the child can move the controller in any direction and click on various navigational tools using either a sip or a puff. An on-screen keyboard allows the child to type using the same movements.

Sip-and-puff systems are a type of switch device, which refers to the technology used to replace a computer keyboard or mouse. Other switch devices include buttons or other objects that a student can touch, push, pull, kick or perform some other simple action that can then control the device.

Jouse 3

The Jouse3 is a sip-and-puff system that allows children to control a device using any part of the mouth, cheek, chin or tongue. Due to its accuracy and quick response, home users can use it for drawing or computer games. It can mount to the desktop, a bedframe or any other type of structure; it does not require a headpiece or placement on the body of the user.

The product supports Windows, Macintosh, Linux and Unix based computers, in addition to Android and iOS mobile devices. It can support one or two external switches, and has two types of mouthpieces.

Sip-and-Puff Systems from Origin Instruments

Origin Instruments offers a range of sip-and-puff products that students can use to control an electronic device. Using a head mounted or gooseneck user interface or available tubing for a custom solution, the child can control a mouse, joystick or keyboard with ease. The primary system is powered using USB technology.

The product supports Windows, Macintosh and Linux based computers. Two pressure switches connect the system to the user interface solution for use on electronic devices.

Proofreading Software

Proofreading software is a branch of assistive technology that goes above and beyond the typical proofreading features found in a word processing system, such as correcting words frequently misspelled by students with dyslexia. A number of other features offered within this category can help students work on his or her English skill set to become a more effective and accurate writer.

Although primarily geared towards individuals with dyslexia, proofreading software can be helpful to those with any type of learning disorder that makes writing and reading challenging.

Ginger

Ginger offers several features that can help students with dyslexia and other learning disorders with writing. It is also designed for speakers of languages other than English. Some of the features include:

- Grammar checker that analyses context to determine any errors or misspellings. For instance, Ginger can recognize whether "there," "their" or "they're" should be used in a sentence, which is a common mistake in writing.
- Word prediction and sentence rephrasing tools that can be helpful for students learning how to construct sentences properly.
- TTS functionality so students can hear what they've written.
- A personal trainer that provides practice sessions based on past mistakes made by the student.

Ginger is available for Windows and Macintosh systems, as well as for use on iOS and Android mobile devices.

Ghotit

Ghotit is specifically designed for students with dyslexia and other learning disorders who have difficulties with writing. The name is inspired by the word "Ghoti," which is a constructed term that illustrates irregularities in the English language. And since many spellings are counterintuitive - especially for those with dyslexia - Ghotit dedicates itself to assisting children and adults who struggle with writing accurately.

It features the ability to learn from the user's past mistakes, personalizing suggestions for spelling and grammatical errors. Ghotit can predict words, check passages of text contextually, read text aloud using TTS technology and recognize split and merged words. It also includes an integrated dictionary for students to quickly look up a word.

Math Tools

A range of technology and tools can help students that have trouble with math, most commonly found in a learning disability called dyscalculia. Dyscalculia makes it difficult to grasp numbers and it is characterized by a general lack of understanding in the field of math.

Assistive technology in math is not just for those with dyscalculia. It can also help students with blindness, fine motor skill disabilities or some other type of disability that makes it difficult to perform math-related work.

MathTalk

MathTalk is a speech recognition software program for math that can help students with a range of disabilities. From prealgebra to Ph.D. level mathematics, students can perform math problems by speaking into a microphone on their computer. The program works with Dragon NaturallySpeaking programs for voice-to-text functionality, making it ideal for students who have fine motor skill disabilities. Students with blindness or vision disabilities can use the integrated braille translator.

In addition to these audiences, MathTalk also appeals to students with dyscalculia. The program functions as an electronic math worksheet, allowing the child to organize, align and work through problems on the screen, making it helpful for students who have difficulties performing math problems on paper.

Math Simulations

Math simulations can help students with dyscalculia visualize math problems and concepts. As a result, students can better understand the application of a particular type of problem, since many students struggle with the conceptual aspects of math.

5.4 Application of Technology in Assistive Devices

5.4.1 Assistive devices and technologies

Assistive devices and technologies are those whose primary purpose is to maintain or improve an individual's functioning and independence to facilitate participation and to enhance overall well-being. They can also help prevent impairments and secondary health conditions. Examples of assistive devices and technologies include wheelchairs, prostheses, hearings aids, visual aids, and specialized computer software and hardware that increase mobility, hearing, vision, or communication capacities. In many low-income and middle-income countries, only 5-15% of people who require assistive devices and technologies have access to them.

5.4.2 Technology Areas

Academic and Learning Aids: Many students with disabilities use assistive technology to enhance their participation and achievement in their educational programs. There are a range of assistive technology solutions to address student needs in all academic areas including reading, writing and spelling, math, and study and organization.

Aids to Daily Living: Many students with disabilities use assistive technology to enhance

their participation and achievement in their educational programs. There are a range of assistive technology solutions to address student needs in all academic areas including reading, writing and spelling, math, and study and organization.

Assisted Living Devices and Environmental Aids: Students who are hard of hearing or deaf often need assistive technology to access information that is typically presented verbally and accessed through the auditory modality. A variety of technology solutions are available that amplify speech and other auditory signals or that provide an alternative to the auditory modality. These include assistive listening devices that amplify sound and speech both in the classroom and home environment, text telephone (TTY), closed captioning devices, real time captioning, and environmental aids that support independent living skills.

Augmentative Communication: Students with severe expressive communication impairments have difficulty communicating with peers and adults within their environments. Many of these students need a means of supplementing their communication skills. These students frequently use augmentative communication technology. A range of low technology to high technology solutions are available including: object based communication displays, picture communication boards and books, talking switches, voice output communication devices and computer based communication devices.

Computer Access and Instruction: A variety of technology solutions are available to adapt the classroom computer for students with disabilities. Some computer access technology offers a method of input other than the standard computer keyboard and mouse. Other computer adaptations include software and hardware that modifies the visual and sound output from the computer. Varieties of devices are available and include the following: adaptive pointing devices, keyboard adaptations.

Environmental Control: High technology environmental aids are available to assist students with physical disabilities in controlling electronic appliances within the school and home. These devices allow the student to use an alternate input device such as a switch to control one or more electronic appliances such as lights, televisions, and electronically controlled doors.

Mobility Aids: Students with physical disabilities often need access to mobility aids to provide them with a means of moving about their environments. Mobility aids include canes, crutches, walkers, scooters, and wheelchairs. Generally, assistive technology devices such as the mobility aids referenced above are recommended by physical and occupational therapists based on the student's individual needs.

Oral Communication and the AAC: Assistive Technology in the field of Oral Communication can include a variety of areas to assist individuals with speech or language difficulties.

Pre-Vocational and Vocational Aids: Students with physical and cognitive disabilities who are enrolled in educational programs that address pre-vocational and vocational skills may benefit from the use of pre-vocational and vocational aids. These types of technology solutions include modifications of the tools and manipulative used in the completion of work related tasks. Low technology solutions include grips for handling materials and stabilization devices for supporting work materials. For students using electronic appliances such as staplers and paper shredders, an environmental control unit such as the model available from AbleNet can be used to allow for switch control of the appliance. Many of the adaptations required for participation in work activities may be teacher constructed. For example, a picture-based task schedule can be created to represent all of the steps in a particular activity for students with intellectual disabilities.

Recreation and Leisure: Some students with physical, sensory, and intellectual disabilities require assistive technology in order to participate more fully in appropriate recreation and leisure activities. A range of low technology to high technology solutions are available including game adaptations, book adaptations, switch adapted toys, and environmental control access for televisions, videos, tape players, CD players and MP3 players.

Seating and Positioning: Students with physical disabilities often require adaptive seating and positioning systems as an alternative to the standard classroom seating systems. Adaptive seating and positioning systems include seat inserts for wheelchairs, side liars, prone sanders, and adaptive chairs. These seating and positioning systems are generally determined by the physical and occupational therapist in consultation with the classroom staff. Sammons Preston offers several different seating and positioning devices for the classroom.

Visual Aids: Students with visual impairments can benefit from assistive technology in a variety of areas. A critical need for assistive technology is often in the area of accessing printed information and to providing a means of producing written communication. There are many visual aids including talking dictionaries, adapted tape player/recorders, large print and talking calculators, braille writers, closed circuit televisions (CCTV), and software such as screen reading and text enlargement programs.

5.4.3 JAWS Screen Readers

JAWS, Job Access With Speech, is the world's most popular screen reader, developed for computer users whose vision loss prevents them from seeing screen content or

navigating with a mouse.

JAWSis a screen reader for Microsoft Windows offered by Freedom Scientific, Inc. JAWS will assist users who are blind or low-vision to use a Windows computer. A JAW has a variety of features, including Braille support, multi-lingual speech synthesis, and multi-screen support. It stands for "Job Access With Speech." JAWS works with the PC to provide access to software applications and the Internet. JAWS also outputs to refreshable Braille displays.

Features

- Two multi-lingual synthesizers: Eloquence and Vocalizer Expressive
- Talking installation
- Built-in free DAISY Player and full set of DAISY-formatted basic training books
- Works with Microsoft Office, Internet Explorer, Firefox, and much more
- Supports Windows 8.1 and Windows 10, including touch screens and gestures
- Support for MathML content presented in Internet Explorer that is rendered with MathJax
- Fast information look-up at your fingertips with Research It
- Convenient OCR feature provides access to the text of PDF documents, even those with scanned images that are reported as empty documents by screen readers
- Save time with Skim Reading
- The only Windows screen reader to provide contracted Braille input from your Braille keyboard
- Fully compatible with MAGic, screen magnification software, and Open Book, scanning and reading program

Advanced Features

- JAWS Tandem available for free to help with support and training
- Optional support for Citrix, Terminal Services, and Remote Desktop
- Powerful scripting language to customize the user experience on any application
- Includes drivers for all popular Braille displays
- Includes voices for over 30 different languages
- Distributed worldwide with local sales and support in most countries

Powerful Access to Screen Content

JAWS is the world's most popular screen reader, developed for computer users whose vision loss prevents them from seeing screen content. JAWS reads aloud what's on the PC screen and gives the user a unique set of intelligent tools for navigating and accesses Web pages and all screen content.

Compatible with the Most Frequently Used Workplace and Classroom Applications

JAWS enable you to work with Lotus Symphony, a suite of IBM tools for word processing, spread sheets, and presentation creation and with Lotus Notes by IBM. JAWS also is compatible with Microsoft Office Suite, MSN Messenger, Corel WordPerfect, Adobe Acrobat Reader, Internet Explorer, Firefox - and many more applications that are used on a regular basis on the job and in school.

Unmatched Braille Support

With a refreshable Braille display like Freedom Scientific's Focus, JAWS also provides Braille output in addition to, or instead of, speech. An array of versatile features and customizable options lets you tailor JAWS for your individual needs and preferences

5.4.4 Smartphones

Assistive Technology is an ever-changing group of products and devices. Today devices everyone uses can be easily adapted to assist those with special needs. The current trend for technology is to make it simple to learn, to use, integrate, and support. This is welcome news to parents and caregivers of children with special needs. This new trend allows for more people to have the ability to use the technology.

Smart phones are an excellent example of technology with the potential to enhance the teaching and learning experience of children with disabilities. In addition to serving as a means of communication, smart phones have the capability to run multiple applications that support and accompany students in their day-to-day activities. For example, the iPhone offers the application isign. The app facilitates communication between deaf students and general education teachers and other who do not sign. Students and teachers who need to learn American Sign Language can use the program containing 800 signs with gestures modelled with a 3D character.

Students with hearing and speech impairments can communicate with their hearing peers and teachers using the Google Android phone and an application called Speaking Pad. Users of these technologies enter data into their cell phone and then make information available through speech output.

Another application can be used by students with autism and other disabilities to create and organize personal tasks. iPrompts, which provides visual prompting tools to help users transition between activities, understand upcoming events and make choices and focus on tasks.

For students with visual impairments, screen magnifiers are available, enabling user to capture text and images with a built-in camera and then enlarge items that appear on the phone's screen.

At the same time, applications designed for people with disabilities are crossing over into the mainstream, blurring the distinctions between AT and consumer technologies. Text-to-speech is an integral part of in vehicle GPS units and cell phones, screen magnifiers help consumers cope with shrinking screen sizes, and captions on TV and internet video are being used to reinforce language learning and to provide viewing solutions for noisy environments.

5.4.5 Screen Readers

Screen readers are software programs that allow blind or visually impaired users to read the text that is displayed on the computer screen with a speech synthesizer or braille display. A screen reader is the interface between the computer's operating system, its applications, and the user. The user sends commands by pressing different combinations of keys on the computer keyboard or braille display to instruct the speech synthesizer what to say and to speak automatically when changes occur on the computer screen. A command can instruct the synthesizer to read or spell a word, read a line or full screen of text, find a string of text on the screen, announce the location of the computer's cursor or focused item, and so on. In addition, it allows users to perform more advanced functions, such as locating text displayed in a certain color, reading pre-designated parts of the screen on demand, reading highlighted text, and identifying the active choice in a menu. Users may also use the spell checker in a word processor or read the cells of a spreadsheet with a screen reader.

How does a screen reader relay information to the user?

There are two ways that a screen reader can provide feedback to the user:

- **Speech;**
- **Braille.**

A screen reader uses a Text-To-Speech (TTS) engine to translate on-screen information into speech, which can be heard through earphones or speakers. A TTS may be a software application that comes bundled with the screen reader, or it may be a hardware device

that plugs into the computer. Originally, before computers had soundcards, screen readers always used hardware TTS devices, but now that soundcards come as standard on all computers many find that a software TTS is preferable. In addition to speech feedback, screen readers are also capable of providing information in Braille. An external hardware device, known as a refreshable Braille display is needed for this. A refreshable Braille display contains one or more rows of cells. Each cell can be formed into the shape of a Braille character, a series of dots that are similar to domino dots in their layout. As the information on the computer screen changes, so does the Braille characters on the display change, providing refreshable information directly from the computer. Whilst it is possible to use either format independently, Braille output is commonly used in conjunction with speech output.

How does a screen reader work?

Since the majority of screen reader users don't use a mouse, all screen readers use a wide variety of keyboard commands to carry out different tasks. Tasks include reading part or whole of a document, navigating web pages, opening and closing files, editing and listening to music. A visually impaired computer user will use a combination of screen reader commands and operating system commands to accomplish the many tasks a computer is capable of performing. All current operating systems have their own keyboard shortcuts, which are available to everyone not just screen reader users. An example of a Microsoft Windows keyboard shortcut is using the alt + A key combination to open the Favourites menu in Internet Explorer. Each screen reader uses a different series of commands, so most people will tend to choose a screen reader and stick with it, as the task of learning a large number of new keyboard commands is considerable.

Which operating systems do screen readers work with?

Screen readers are available for each of the most common operating systems, Linux, Mac OS and Windows.

5.5 Application of Technology in Instruction: Individual, Small Group and Large Group

The information age with the mass of technology it brings can be both blessing and curse for the teaching and learning environment. As lecturer and teacher one is confronted with new roles, new work, new decisions, new skill requirements, new language, and last but not least, a new generation of learners (with their own unique new excuses!). On the other side of the coin there are unprecedented opportunities to use technology to enhance learning, to increase the excitement of the subject matter and to expose learners

to their subject in "real life". This brings with it the temptation to use all the "bells and whistles" of the wonderful hardware and software available, and leaves many of us confused and overwhelmed as to what is useful and what is over the top.

5.5.1 Enhancing Small Group Instruction through Technology

Classroom interaction, combined with online activities, can greatly accelerate the learning process and reduce the time.Technology is a tool that can change the nature of learning.

First and foremost, educators want students to learn. It is certainly not enough to tell educators that they need to use the boxes and wires that have invaded their schools simply because they are expensive or because students need to know how to use the latest widget. If it's clear that technological tools will help them achieve that goal, educators will use those tools.

The real world is not broken down into discrete academic disciplines. I've heard a number of teachers say that they would like to be able to change the way they teach -- to find ways to implement project-based, multidisciplinary lessons. Let's think about how that might happen when technology is used to support learning.

Technology lends itself to exploration. But before technology can be used effectively, exploration must be valued as important to both teaching and learning. In a technology-rich classroom, students might search the Web for information, analyze river water, chart the results, and record what they've learned on the computer.

In many small group teaching situations, the role of the teacher is that of facilitator of learning: leading discussions, asking open-ended questions, guiding process and task, and enabling active participation of learners and engagement with ideas. However, small groups function and behave in various ways and have different purposes. Teachers therefore need to be able to adopt a range of roles and skills to suit specific situations, often during the same teaching session which technology can support.

Effective tutors are essential to ensuring that small groups work well. Any teaching event will be more successful if the teacher:

- is enthusiastic
- has organised the session well
- has a feeling for the subject
- can conceptualise the topic
- has empathy with the learners

- understands how people learn
- has skills in teaching and managing learning
- is alert to context and 'classroom' events
- is teaching with their preferred teaching style
- has a wide range of skills in their teaching repertoire, including 'questioning, listening, reinforcing, reacting, summarising and leadership' (McCrorie, 2006, p. 8).

Technology has all the above qualities required as an effective small group instructor.

5.5.2 Enhancing Large Group Instruction through Technology

Technology is making it increasingly possible to envision the ideal of customizing instruction on an individual basis. Today schools can implement software that assesses student strengths and weaknesses, builds an individualized learning plan, delivers computer-based content using a variety of interactive methods, and then tests mastery of content standards.

Teaching with technology can deepen student learning by supporting instructional objectives. However, it can be challenging to select the "best" tech tools while not losing sight of your goals for student learning. Once identified, integrating those tools can itself be a challenge albeit an eye-opening experience.

Students Use Information Technologies to:

1. Participate in a media revolution, profoundly affecting the way they think about and use information technologies.
2. Improve the ways of learning in new learning fashions
3. Extend the ability and skills of applying their learning in real situation.
4. Working in groups for cooperative and collaborative learning
5. Developing self-learning habits at their own pace and time.
6. Learn with the teacher rather by the teacher.
7. Develop inquiry-learning habits.
8. Use right information at right time to achieve right objective.
9. Review and explore qualitative data.

10. Exchange learning experiences and information with others students and teachers living anywhere in the world.

Information technologies facilitate students in their learning process through their active participation on one hand and help teachers on the other hand. Therefore, Teachers Use The Information Technologies to:

1. Present the material in more interesting and attractive way.
2. Guide and help students in searching the qualitative material.
3. Make best use of time.
4. Coach the students.
5. Provide individualized instruction.
6. Direct the students toward cooperative as well as collaborative learning activities.
7. Prepare learning material for students, rather teaching in conventional situations.
8. Diagnose the learning problem of students and help them to overcome.
9. Solve the study problems of students.

5.6 Advantages, Merits and Demerits of Application of Technology

Technological advancements have made the world a great and convenient place to live in. There is no denying of how they make lives better and easier, especially in the fields of science, medicine and education. But, like most things, technology also has its drawbacks. In fact, some of the more recent inventions are now being categorized as lazy aids, and are considered major contributors of obesity and a generally unhealthy population.

Can the same thing be said for technology used in the classroom? Tools, such as computers, mobile devices and the internet, are now integrated into the educational system. While they are beneficial in certain academic aspects, they also have negative implications.

5.6.1 List of the Advantages of Technology in Education

1. Promotes independent learning in students

The internet is a treasure trove of information. Practically anything you need to know can be found online. Although there is a question of the credibility of the source and the data provided, it can still serve as an educational resource for students. Even without

assistance from parents and teachers, students can just look up their lessons online.

Unlike regular textbooks, electronic books and web-based content are updated in real time, feeding students with the most current information they can get their hands on, helping them become more knowledgeable even outside the classroom setting.

2. Prepares students for the future

From the way technological advancements are going, it is obvious that the future will be digital and technology-focused. If students are well-versed on using technology to collaborate and communicate as early as now, they will not have trouble fitting in, competing and finding jobs in the future. Being familiar with using at least one form of technology at an early age will help them become comfortable using it, and eventually develop other skills necessary to handle other innovative devices and processes.

3. Has the potential to lower textbook and tuition prices

With resources more accessible and in great abundance, the cost of textbooks is likely to decrease. It is also possible that students may no longer need to buy a textbook, if it is converted into digital format. The actual books can stay in the classroom, while the content is saved on a student's computer.

Tuition will also decrease when learning is done online, rather than inside the classroom. By taking out the factors that contribute to a higher tuition fee, such as utility bills and transportation allowance of teachers, the overall cost of education will be lower.

4. Allows teachers to create an exciting way to educate students

Gone are the days when the only tools for teaching are limited to books, a blackboard or whiteboard, and a chalk or markers. With technology integrated to education, teachers can now incorporate images, videos and other graphics when delivering lessons. Specific websites, apps and programs will also enable teachers to vary how they provide instructions. This creates an exciting learning environment and promotes interest in education in general.

Other tools available for teachers include Smart Boards (interactive whiteboards), email Skype, and PowerPoint.

5. Encourages development of new teaching methods

Rather than spend an hour or so talking while the students listen, or have them read an entire chapter in silence, teachers and professors now have the option to use advanced teaching methods, such as podcasts, blogs and social media. When working with a particular group or one-on-one, teachers can take advantage of web conferencing

technologies other online communication tools.

Technology also presents universal tools that enable teachers to educate all types of students, including those who are struggling or have special needs. These include voice recognition, text-to-speech converter, translator, volume control, word prediction software and other assistive technologies.

5.6.2 List of Disadvantages of Technology in Education

1. Results in a lack of interest in studying

Because everything is now accessible online or through data saved in a computer or mobile devices, students are likely to develop poor studying habits and a lazy attitude towards education. Some of them may even think they can skip school because they can find answers and lessons online. Who needs teachers when you have internet and Google, right?

This can also lead to students forgetting the basics of studying. They would rather rely on computers and the internet, instead of their books and the input from their teachers. Most of them will misspell words because they often use spell checkers. Rather than solve mathematical equations the traditional way, they would seek assistance from computers or look for the answers directly through search engines. When it is time to take the tests in the classroom and without any form of technology, students are likely to fail.

2. Makes students vulnerable to potential pitfalls

While computers prove to be an invaluable educational tool, it can also be a source of problems. This is especially true for students who lack the skills needed to maximize a device's functionalities. Technical problems and computer malfunctions can cause loss of assignments and other materials, resulting in high levels of stress that students would rather not experience. Difference in internet speeds and a device's capabilities can also lead to certain difficulties that will de-motivate students. Add to this other things that they will discover online, which are completely unrelated to school and education, and they will be distracted to no end.

3. Negative views on technology

Consumerism has taught us that technologies, from computers to mobile devices, are widely viewed as tools to entertain rather than educate. Textbooks, on the other hand, are seen as tools for learning. So, between a tablet and a textbook, students are likely to gravitate towards learning when reading a book, while they are likely to use a tablet to

play games or spend time on social media.

4. Raise instructional challenges

For professors and teachers to stay abreast with technology, they may need to be retrained. Those who have been teaching all their lives using traditional methods may not be very susceptible to the changes being applied. They may even see it as a threat to their job security and shun technology altogether. In fact, a majority of teachers believe that constant use of digital technology is affecting a student's attention span and his ability to persevere when a challenging task is thrown his way. Although such belief is subjective, scholars, experts and teachers all agree that technology has changed the way students learn.

5. Can diminish overall value of in-person education

Although research on online learning did not establish a direct link to how personal interaction affects a student's performance, data gathered did show that those who enrolled in online courses have higher chances of failing, dropping out of classes, and are less likely to benefit from them. This may have something to do with the fact that lessons delivered online or through digital resources lack the face-to-face interaction between teacher and student that provides a more personal experience

5.7 Implications for Inclusion

Technology can be the great equalizer in a classroom with diverse learners. Whereas teachers can find it difficult to differentiate instruction for 30+ students in one class, all with different needs and abilities, "assistive technology" (devices and software to assist students with disabilities) can often help teachers personalize lessons and skills enhancement to each child. Children with learning disabilities often have better technology skills than their teachers and are drawn to computers and other gadgets, so using them in the classroom make perfect sense. For children with physical disabilities, technology can give access to learning opportunities previously closed to them. E-readers help students turn book pages without applying dexterity, and voice adaptive software can help students answer questions without needing to write. Computers are engaging and more advanced than the typical modified lesson allows.

Assistive technology is not always just for students with disabilities; it can be used to help any student with motivation, academic skills, and social development.

There is no doubt that technology has changed the way children learn in the classroom. Technology has altered how students engage in learning activities, the format of learning

materials they use, how tasks are completed, and how they demonstrate what they know. The way we as educators design and deliver learning experiences, and what instructional materials we use to enhance student learning, has also changed.

What about students who experience consistent academic failure due to learning difficulties or disabilities? Are computers and other technologies going to assist them to access the curriculum, keep up with their peers and learn how to learn?

Students with learning difficulties can be defined as students who experience particular difficulties in achieving at school that are not due to a disability or impairment. (Ashman, 2005; Westwood, 2003) Students with learning disabilities include those students with chronic academic problems. These students may have been diagnosed with dyslexia, dyspraxia, dyscalculia, dysgraphia or other neurologically based conditions.

Students with learning difficulties and disabilities display a variety of characteristics that can be grouped into four main categories, academic, emotional, motivational, cognitive and metacognitive. (E. Twomey, 2006.)

These students typically encounter learning problems across all curriculum areas. Persistent failure throughout school, despite remediation, may lead some students to develop social and emotional difficulties including low self esteem, an embarrassing reliance on others, low motivation and disengagement from school activities. Poor handwriting, comprehension and organisational difficulties may also be barriers to learning for these students.

Inclusive learning technologies can be described as those technologies, whether software or hardware, that help students learn strategies to bypass, work around or compensate for their difficulties. Many of these technologies incorporate Universal Design features which focus on providing learning resources that accommodate for learner differences.

Inclusive technologies may be designed to remediate specific difficulties and contain key supportive features, while others have many features that support a range of learning needs. They may be standalone programs or may integrate with other commonly used applications.

What types of technologies are there and how can they help?

Reading Tools

Text to speech

Software that incorporates text to speech enables students to access content and information by having text read aloud, often in a high quality, realistic synthesised

voice. This software may highlight words, sentences or paragraphs in selected colours to draw the reader's attention to the text as it is being spoken. Using this method, students are assisted to decode words, and maintain reading fluency and comprehension. Using text to speech, they can read and re-read information as many times as they need.

Talking word processors are one kind of software that incorporates text to speech. Other software packages work with standard software programs such as Microsoft Word, to speech enable them. Many of these programs allow students to read aloud text in a range of formats, including Word documents, PDFs, emails and web pages. Text to speech is also an important support for proofreading, helping students listen for any possible errors in their writing.

➢ **OCR**

Optical Character Recognition (OCR) is a method of converting text from paper format to an electronic version. This is usually carried out by using a scanner. Software that incorporates OCR, may also provide the option of scanning text into a range of formats (such as Word, PDF or other documents). This means that books, printed worksheets, even photographs with graphics and text can be converted to electronic format and read aloud using text to speech. Reading material is instantly made accessible.

➢ **Talking books**

Talking books are essentially books that are in electronic format, often looking very similar to the paper version. They may read text aloud, and include a range of multimedia elements such as real photos, animations, videos and recorded sounds that make the reading experience motivating and fun. The advantage talking books is that they allow students of any age and ability to be independent readers and take advantage of supports if and when they choose. Additional extension activities may be included with some books to help support balanced literacy instruction. Using book making templates, teachers can create their own high interest individualised learning materials.

- **Software that converts text files to audio**

Being able to convert text to an audio file has the advantage of providing yet another format for accessing information and is an ideal way for students to engage in independent revision and study. Students can listen to audio files via their computer or their iPod anytime, any place. Software that has this feature may also include high quality synthesised speech and the ability to save the files in a range of formats including WAV, Mp3 and WMA.

Writing Tools

Common problems for students with learning difficulties and disabilities centre around spelling, grammatical errors, tense and punctuation. They may have ideas which they can articulate very well, but because of spelling problems fall back on using simple sentence construction and vocabulary. These students often need scaffolding to help organise and articulate their ideas into a written format.

- **Organisational software**

Organisational software helps students brainstorm and display their ideas using a concept map of words and/or pictures that can then be transferred to a document outline with the click of a button. Templates to assist students develop their ideas for different writing tasks may also be included as an added feature.

Another strategy for developing a written draft is to use highlighting tools and extract main points from a document or web page. By creating an outline of what has been read, students can use this as a starting point for their writing.

" Onscreen word banks

Learners needing support to spell words or construct meaningful sentences can quickly and easily carry out written tasks using on-screen word banks. This software provides the additional support of text to speech and pictures for those whose visual recognition of words is poor.

" Word prediction

Word prediction is a strategy that assists with spelling and word completion by making suggestions as you type. These suggestions are displayed in a window. Word prediction can help students expand their vocabulary, as they are less likely to avoid words for which they are unsure of spelling. In some cases, the word prediction program may accommodate for phonetic spelling errors. Such programs also learn words that are used frequently. Research studies have reported up to a 70% reduction in spelling errors when using word prediction programs.

" Voice recognition

Voice recognition software allows students to create large amounts of text or control their computer entirely by voice. Documents and e-mails can be dictated without spelling mistakes and the need to extensively use the keyboard and mouse is significantly reduced.

" Portable word processors or notetakers

For students whose handwriting is untidy or illegible, and who find writing with pen and paper frustrating, these devices help overcome these barriers and encourage students to independently take notes rather than rely on a scribe or peers. They are low cost, portable alternatives to laptops. Infrared capabilities mean that no cords are needed when transferring text to a computer for further editing. These devices are lightweight, sturdy and have the advantage of a long battery life. They are easy to use and can be used in conjunction with word prediction programs if the student struggles with spelling

5.8 Let us sum up

Earlier, technology in education was a debatable topic amongst the society. Everyone had their own views on modernizing education and making it technology aided. There were a huge number of positives and negatives to education technology. But, gradually as technology was embraced by the educational institutes, they realized the importance of technology in education. Its positives outnumbered the negatives and now, with technology, education has taken a whole new meaning that it leaves us with no doubt that our educational system has been transformed owing to the ever-advancing technology. Technology and education are a great combination if used together with a right reason and vision.

With technology, educators, students and parents have a variety of learning tools at their fingertips. Here are some of the ways in which technology improves education over time:

- Teachers can collaborate to share their ideas and resources online: They can communicate with others across the world in an instant, meet the shortcomings of their work, refine it and provide their students with the best. This approach definitely enhances the practice of teaching.
- Students can develop valuable research skills at a young age: Technology gives students immediate access to an abundance of quality information which leads to learning at much quicker rates than before.
- Students and teachers have access to an expanse of material: There are plenty of resourceful, credible websites available on the Internet that both teachers and students can utilize. The Internet also provides a variety of knowledge and doesn't limit students to one person's opinion.

- Online learning is now an equally credible option: Face-to-face interaction is huge, especially in the younger years, but some students work better when they can go at their own pace. Online education is now accredited and has changed the way we view education.

Technology that is made use of in the classroom is very beneficial in helping the students understand and absorb what they are being taught. For instance, since there are a number of students who are visual learners, projection screens connected to computers could be put in classrooms to let the students see their notes as opposed to simply sitting down and listening to the instructor teach.

There is a number of very good software that can be used to supplement the class curriculum. The programs make available to students quizzes, tests, activities and study questions that could help the students continue with the learning process when they are out of the classroom.

Today, technology has been incorporated into a good number of curriculum even those that do not belong to the technology and computer classes. Students make use of computers to come up with presentations and also make use of the internet to carry out research on a variety of topics for their essays and papers.

Students also get to know how to use the technology available in the world today through the tech and computer classes. This gives the guarantee that following their graduation, the students will not have any difficulties with using technology when they are out there in the work place, which might serve to make them more competitive compared to an individual who has no access to a certain software or technology in school.

With the continuing advances in the technological world, students are getting improved access to such educational opportunities. Every time something 'better' and 'new' is brought into the market, the price of the existing technology is decreased which makes it much more accessible in the educational setting even to those schools that might not have a lot of financial resources available to them.

Technology has greatly grown to the point that it is also available today to assist those kids who are yet to begin school. There are a number of educational systems and video games for the small children that assist them in getting ready for school and in a number of situations also give them a head start on their education.

5.9 Check your Progress

1. Write about the different assistive devices used for children with special needs.
2. Discuss about the use of Screen readers for children with visual impairment.
3. Comment on the implications of technology in an inclusive classroom.

5.10 References for further reading

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Any system of education which ignores Indian conditions, requirements, history and sociology is too unscientific to commend itself to any rational support.

— Subhas Chandra Bose

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