

NETAJI SUBHAS OPEN UNIVERSITY



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4.1 Introduction

Technology is everywhere in education: Public schools in the United States now provide at least one computer for every five students. Learning management systems, student information systems, and other software are also used to distribute assignments, manage schedules and communications, and track student progress. Educational software and applications have grown more “adaptive,” relying on technology and algorithms to determine not only what a student knows, but what his or her learning process is, and even his or her emotional state. For all the technological progress, though, implementation remains a major challenge. Schools and educators across the country continue to wrestle with the changing role of teachers, how to balance flexible and “personalized” models with the state and federal accountability requirements they still must meet, and the deeper cultural challenge of changing educators’ long-standing habits and routines. Despite the massive investments that many school systems are making, the evidence that digital personalized learning can improve student outcomes or narrow achievement gaps at scale remains scattered, at best.

4.2 Objectives

After learning this unit the learners will be able to:

- Know about the technological impact on education
- Know about the changing trends in teaching and learning process
- Know about various technology products for educational purposes
- Know about the technology based educational services
- Know about the importance of Information and communication technology and its impact on education of children with hearing impairment
- Know about the future technologies and universal design also

4.3 Technology and its impact on education: changing trends in teaching and learning

The definition begins with the proposition that “educational technology is the study and ethical practice of facilitating learning . . .” indicating that helping people to learn is the primary and essential purpose of educational technology. All of the AECT definitions since 1963 have referred to learning as the end product of educational technology. However, the definitions have differed regarding the strength of the connection between technological interventions and changes in learner capability.

According to Association for Educational Communications and Technology as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources". Educational technology refers to the use of both physical hardware and educational theoretics. It encompasses several domains, including learning theory, computer-based training, online learning, and, where mobile technologies are used, m-learning. Accordingly, there are several discrete aspects to describing the intellectual and technical development of educational technology:

- Educational technology as the theory and practice of educational approaches to learning
- Educational technology as technological tools and media that assist in the communication of knowledge, and its development and exchange
- Educational technology for learning management systems (LMS), such as tools for student and curriculum management, and education management information systems (EMIS)

- Educational technology itself as an educational subject; such courses may be called "Computer Studies".

When children with disabilities are given opportunities to flourish as any other children, they have the potential to lead fulfilling lives and to contribute to the social, cultural and economic vitality of their communities. Yet surviving and thriving can be especially difficult for children with disabilities. All too often they are isolated and excluded, cut off from health, education and social services, and with limited opportunities to participate in family and community life. This frequently impacts on their future employment opportunities and participation in civic life. Assistive technology includes products and related services that improve the functioning of children with disabilities. It can be instrumental for children's development and health, as well as for participation in various facets of life. These include communication, mobility, self-care, household tasks, family relationships, education, and engagement in play and recreation. Assistive technology can enhance the quality of life of both children and their families.

Assistive technology is one of the key elements to advancing inclusion of children with disabilities together with additional supports such as personal assistance, sign language interpreters and removal of barriers. Access to assistive technology for children with disabilities is critical for many to access and benefit from education. Access to assistive technology is a precondition for achieving equal opportunities, enjoying human rights and living in dignity. Girls and boys with disabilities are entitled to available and affordable assistive technology.

The global need for assistive technology for children has not yet been adequately quantified. Estimates indicate that about 0.5% of a population need prosthetic or orthotic devices, about 1% need a wheelchair, and about 3% need a hearing aid. These needs vary between countries as well as between regions within

a country due to factors such as variations in age distribution and prevalence of various impairments. In developing countries, up to 0.6% of children have hearing impairments within the neonatal period. However, hearing aids are not always an appropriate solution. In Chile and China, about 7-9% of school aged children would benefit from using properly prescribed eyeglasses. In Sweden, about 0.2% of all children aged 0-17 years use wheelchairs. In some African countries, the largest discrepancy between self-reported needs for and received rehabilitation services was found to be in the area of assistive technology. WHO estimates that only 5-15% of assistive technology needs are met in many developing countries. Studies in Malawi and Namibia indicate that more than 80% of those who need assistive technology do not have it.

When appropriate to the user and the user's environment, assistive technology is a powerful tool to increase independence and improve participation. It helps individual children become mobile, communicate more effectively, see and hear better, and participate more fully in learning activities. Moreover, assistive technology supports children to access and enjoy their rights; do things they value; and bridges disparities between children with and without disabilities. It provides the means of access to and participation in educational, social and recreational opportunities; empowers greater physical and mental function and improved self-esteem; and reduces costs for educational services and individual supports. Benefits in areas such as health, mobility and education have been linked to the use of assistive technology. By improving access to education and increasing achievement in school, assistive technology can have a positive socioeconomic effect on the lives of children with disabilities.

By facilitating the participation and inclusion of children with disabilities in all aspects of life, assistive technology can impact on self-image, self esteem and

sense of self-worth. In a study in Bangladesh, the use of assistive technology was associated with better attitudes from community members. “Given opportunities to flourish as others might, children with disabilities have the potential to lead fulfilling lives and to contribute to the social, cultural and economic vitality of their communities”. Assistive technology reduces costs when it supports early childhood development and educational achievement, and avoids repetition of learning missed due to educational barriers. It reduces costs by supporting independent functioning and access to healthcare in lieu of personal support services, and independent community living in lieu of institutionalization. Assistive technology may “reduce the need for formal support services, reduce the time and physical burden for caregivers, [and prevent] falls, injuries, further impairments and premature death”. The link between school dropout and unemployment is clear, and frequently leads to high costs for society. An educated child with a disability supported by assistive technology will have better opportunities for employment. This results in less dependence on welfare and social security measures, greater contribution to the country’s economy and gross domestic product (GDP), and a return on investment that goes beyond an individual family to the larger nation. For example, in Sweden, the cost for assistive technology for a student is recovered if he or she is able to enter the labour market just one month earlier due to this technology. Thus, assistive technology is an important part of any development strategy.

Providing assistive technology to children as early as possible will facilitate their development and prevent secondary conditions such as deformities. For example, correction of a clubfoot by the means of a simple foot orthosis at an early age may reduce the need for costly surgery at an older age. Some children with severe disabilities that are unable to attend school can access education from home

and communicate with others with the help of assistive technologies, accessible information and communication technologies (ICTs) or cloud-based services. ICTs offer new ways to break down accessibility barriers and provide children with disabilities the opportunities to exchange knowledge and information, and to communicate in ways they otherwise have not been able to do. ICT tools and applications are paving the way for children with disabilities to access educational materials and resources in different formats and to engage in the same academic activities as their peers without disabilities.

There are over 11 million people with a limiting long-term illness, impairment or disability in the UK. Many of them are using educational resources and completing university courses. Universities have a responsibility to provide these students, and all students, with the necessary learning materials regardless of their accessibility needs. It is here, in the place where educational resources and students with disabilities intersect, that technology has a vital role to play. Technology could operate as the great equalizer. It could and indeed, it should help move all students towards a level playing field. This is particularly true in when it comes to learning resources, and specifically textbooks.

Textbooks are core to the university learning experience, yet for students with disabilities, particularly those with visual impairments, they can be a challenge. Static print sizes, outdated tools to translate print to speech, and complicated page layout and design can make it harder for those with a disability. This in turn impacts on the quality of their educational experience. A study conducted by the Higher Education Academy among students in the UK indicated that resources are a common issue affecting the happiness of disabled students.

Consider another statistic: according to the Office for Disability Issues, disabled people are around three times less likely to hold any qualifications than non-disabled people, and around half as likely to hold a degree-level qualification. A total of 19.2% of working-age disabled people do not hold any formal qualification. Technology can change things. One area in which this is true is e-textbooks, the digital representation of a print text. In the shift from print textbooks to e-textbooks, accessibility can be moved to another level. Suddenly text isn't an unchangeable object; it can be scaled up or down depending on the student's needs. Images can be read aloud through tagging tools. Access to print-fidelity page images means students can follow along in lectures page by page. Simultaneously, access to text representation (suited to screen readers and text-to-speech software) means students can adjust their e-textbook according to their needs.

Through technology, learning is becoming increasingly flexible. It can move outside the lecture hall, on to podcasts, and across devices, becoming available anywhere and at any time. The Higher Education Academy noted that students with disabilities have a need for flexibility. Technology can help provide this. Students no longer have to carry around heavy textbooks. Nor do they have to go physically to the library or bookshop to access learning materials.

Resources such as e-textbooks have taken off in the past few years. In the US, the Student E-rent Pilot Project (STEPP) programme offers e-textbooks specifically modified for accessibility, in support of the Americans with Disabilities Act and the Rehabilitation Act of 1973, Section 504. A survey of 1,185 students found that 77% reported having saved money by renting their textbooks, and 80% who needed an accessible textbook were satisfied with the quality of accessibility.

It's only a matter of time before similar technological developments happen in the UK. Over the past few years, concerns about the student experience for individuals with disabilities have grown. Today's students are paying more than ever for a university education. Higher tuition fees and a growing awareness of disabilities will drive developments in technological resources. Yet there's another dimension to consider: in an era of increased fees, affordable educational resources are key. All students are concerned to find savings. Students with print-related disabilities should be able to enjoy the cost-saving benefits made possible by online learning materials. They also should be able to access the countless digital efficiencies of these resources, the types that their peers have enjoyed for years.

While technological advances have been happening, there is still more to be done. Universities, companies, and e-textbook providers need to emphasise low-barrier, commercial alternatives for all higher education accessibility needs. They need to aim to provide industry-leading access to all subject areas, including Stem subjects.

Providers need to go beyond content access and come up with more universal design study tools that assist all students. Technology has helped increase accessibility in universities, but there is still a way to go.

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 makes 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. The widely-used teacher education textbook **Educating Exceptional Children** has a special section in each chapter focused on assistive technology explaining how it is used with exceptionalities ranging from giftedness to autism. 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.

UNC's Center for Literacy and Disability Studies uses technology in their mission to promote literacy and communication for individuals of all ages with disabilities. The Center has developed a three-part video on reading assessment and assistive technology that explains evidence-based practices of improving literacy through technology. Additionally, the Center has developed “alternative pencils” for students with disabilities who cannot hold a traditional pencil or see a page, including children with deaf-blindness. These technologies include alphabet eye gaze frames allowing children to “point” to letters with their eyes, onscreen keyboards that are controlled by switches, and electronic flipcharts.

LEARN NC (Learn NC was a program of the University of North Carolina at Chapel Hill School of Education from 1997 – 2013. It provided lesson plans, professional development, and innovative web resources to support teachers, build community and provide K – 12 education in North Carolina. Learn NC is no longer supported by the School of Education – this is a historical archive of their website) **offers an extensive set of resources** to help teachers meet the needs of all learners,

including “Reaching Every Learner: Differentiating Instruction in Theory and Practice,” a series of articles and web conferences about differentiation. In addition, LEARN NC’s technology integration page provides links to web resources, lesson plans, articles, and online courses designed to help educators incorporate technology into their teaching

Voice thread is a free software program that captures student voices and photos in order to collaborate on a topic. It is a technological substitute for written papers and allows students freedom to narrate their own projects.

Sounding Board is an ipad/ipod Touch app that lets a student turn their device into a story board communicator. Students with writing disabilities and communication disorders can use the symbols to create their own messages in the same way that traditional symbol boards work, but easily and with a limitless supply of symbols.

Tech matrix offers consumer guides and links to software and assistive technology devices for students with disabilities. The site is sponsored by the National Center for Technology Innovation and the Center for Implementing Technology in Education. Tech matrix gives information and links to resources for teaching science, math, reading, and writing using technology with special education students.

4.4 Technology products for educational purposes: listening (induction loop/FM/IR), visual (speech to text/ text to speech) audio visual (computer based learning & self learning packages, multimedia)

Technology plays an important role in providing a delivery mechanism to reach the next generation of explorers to inspire, inform, and involve them in

NASA research activities and encourage them to pursue science, technology, engineering and mathematics fields. NASA is committed to distributing educational information through instructional and outreach products. In the future, powerful technologies will enable new learning environments to be developed that use simulations, visualizations, immersive environments, game playing and learner networking. These tools will create rich and compelling learning opportunities, thereby meeting the needs of learners while empowering educators and other adults to unlock the potential of a student's mind. Learning will be on demand, meaning that students, educators, and the general public will have access to exactly what they need when they need it. NASA is moving toward this education future by developing new methods for making its exciting discoveries and valuable resources available to students, educators and the public.

Flash notes allow students to upload their lecture notes and sell them to other students who need more help or resources. The rating system allows the best note takers to get more business and the general pool of knowledge expands as students continue to share their work with one another.

Study Blue's main attraction is that it is mobile. Whether standing in line for coffee, riding the train, or waiting at the dentist, a student can easily access their class work and prepare for an exam. The social aspect also helps students find other people studying similar subjects, capitalizing on a different set of notes and study guides.

Imagine the ability to sign your name on a digital document using only your finger and the air. That is technology behind LEAP Motion, a company intent on giving people a more natural way to interact with the computer. LEAP has developed a piece of hardware that allows anyone to write, draw, zoom, play, and

interact with their computer screen using a finger, fingers, or entire hand. By moving your hand over the device, the mouse follows your movements.

Celly is a text-messaging network that allows anyone to create a network anywhere- at a rally, event, in the classroom, or on a field trip using smart phones. Teachers that have used this in their classrooms have noted that those who normally never speak up...do. It forces students to write their thoughts clearly and concisely. Rather than fighting the tide against texting, instructors are using it for academic purposes. Lesson Cast allows teachers to submit a 2-minute lesson plan strategy, idea, or resource using video, documents, Power point, etc. and share it with other instructors.

Kid Blog provides a safe opportunity for children to start up their own blog connected to the classroom. Teachers can help students design a blog around a science project, a history lesson, or an entire year's worth of school progress. The students get the benefit of other students and parents commenting on their work- a great motivation for hesitant writers. Kid Blog makes it easy to keep the child and content secure from the dangers of the Internet.

This new technology (Knewton) company aims at personalizing content for optimal learning. The platform monitors the student's activity and uses the information to give the student the best personalized resources based on their level of performance. The technology also boasts integration among different disciplines creating a more comprehensive set of resources that interact with one another. Knewton grows more intuitive the more the student uses the software. It can follow a student through their entire education career.

Induction loop systems help people who are deaf or hard of hearing pick up sounds more clearly, by reducing background noise. They work in a particular area when a person's hearing aid is switched to the 'T' setting (or loop programme). This allows them to focus on sounds – such as a person speaking – from the loop system microphone, rather than the internal hearing aid microphone, which will normally amplify all noises in the area. The system helps hearing aid users to communicate efficiently and confidentially, even in noisy environments where deaf and hard of hearing people often struggle.

A **room loop** is used where people are gathered in an audience, such as lecture or conference halls, theatres, meeting rooms, places of worship, residential homes, community centres or court buildings. It helps overcome factors such as poor acoustics, background noise or distance from the speaker. Room loops comprise of a microphone, an amplifier and a length of cable that is “looped” around the room, often hidden away in the ceiling, under the carpet or around the skirting board. Hearing aid users simply switch to the 'T' setting to amplify speech directed into the microphone.

An **infrared system** has a similar function to a room loop but uses different technology. Sound, such as somebody's voice, feeds into a microphone and is processed in a pre-amplifier or mixer before being passed to an infrared radiator. This transmits the signal as invisible infrared light to a receiver borrowed from the venue and worn by the listener. Hearing aid users use a neck loop with the receiver to transfer the signal into their hearing aids, but those without hearing aids can plug a set of headphones into the receiver and benefit from the amplified sound as well.

A **counter loop** is used in areas of initial customer contact, such as customer service desks, ticket offices, till areas, bank counters, hotel receptions etc. A permanently installed system is best for busy counters where there is a regular need for hearing support. Counter loops are mains-powered and discreetly installed out of view, with only the microphone visible. The system enables easy voice communication through such barriers as security screens, other conversations, or background noise.

A **portable loop**, such as the Loop Hear, has a microphone, amplifier, loop cable and rechargeable battery all built into a single unit. This can be carried from place to place as needed. This flexibility makes portable loops ideal for meetings across a desk, in interview rooms or at counters. Because they require no installation, they are also good value for money. However, they have a more limited range than an installed loop and take up more space.

Loop systems, however, have seven distinct advantages over these other hearing assistive systems. Here are some of the advantages that make loop systems so valuable, not only to hard-of-hearing people, but also to the owners of looped venues.

- Since audio-frequency loop systems make use of the principles of magnetic induction, hard-of-hearing people wearing hearing aids that have telecoils do not need any other equipment in order to clearly hear the sound source. They can freely move around or sit anywhere within the area covered by the hearing loop.
- Hard-of-hearing people can use their own telecoil-equipped hearing aids which are correctly matched to their specific hearing losses. They do not

have to take their hearing aids off in order to use the facility's assistive device.

- Telecoils do not use any additional power so they do not drain a hearing aid's battery faster than normal.
- Hard-of-hearing people with telecoils in their hearing aids do not require special receivers that they otherwise would have to pick up before, and return after, each meeting. Nor do they have to worry about the batteries going dead and search out a staff person who can replace the batteries.
- Facility operators do not have to supply the receivers, make them available for pickup and ensure their return. This saves them manpower and money. Thus, loop systems are a win-win situation for both hard-of-hearing people and the facility operators of looped facilities.
- Loop systems give accessibility access. Did you know that there are 12 to 15 **times** as many hard-of-hearing people as there are people in wheel chairs. Wheelchair ramps abound. Why not loop systems too? That is why hearing accessibility is so important.
- Loop systems are universal. There is nothing proprietary about them. This means they will work with any hearing aids that have telecoils. Furthermore, they can work anywhere in the world since they are not dependent on proprietary technology nor on a specific frequency band.

Disadvantages:

- Perimeter loops (single wire around the room) cannot be used at the same time in adjacent rooms due to the spillover effect. However, phased array technology (a "mat" or "grid" of multiple wires) provides significantly less

spillover, thus allowing loops to be installed and used simultaneously in adjacent rooms

- Loops might be difficult or impractical to install at some facilities
- No privacy as signal is universal and not encrypted.
- While it's possible that fewer receivers will be needed, some patrons might not use hearing aids but still experience difficulty hearing in large venues. Hence, facility owners will still be required to maintain, clean, dispense and collect receivers and keep receiver batteries charged
- T-Coil receivers (inside hearing aids/cochlear implants or used with earphones) are susceptible to electromagnetic interference from electrical equipment. Therefore, care needs to be taken to reduce/eliminate this interference before installing the loop system
- Cannot support hearing assistance and audio description for the blind and cannot support multiple languages

The personal FM system consists of a transmitter microphone used by the speaker (such as the teacher in the classroom, or the speaker at a lecture) and a receiver used by the listener. The receiver transmits the sound to the listener ears or, if you wear a hearing aid, directly to the hearing aid. Personal FM systems are useful in a variety of situations, such as in a classroom lecture, in a restaurant, in a sales meeting, or in a nursing home or senior center. FM systems are also used in theaters, places of worship, museums, public meeting places, corporate conference rooms, convention centers, and other large areas for gathering. In these situations, the microphone/transmitter is built into the overall sound system. User are

provided with an FM receiver that can connect their hearing aid or cochlear implant. The receiver can also connect to a headset if user don't wear a hearing aid.

There are many advantages to the use of frequency modulation. These have meant that it has been widely used for many years, and will remain in use for many years.

- **Resilient to noise:** One of the main advantages of frequency modulation that has been utilised by the broadcasting industry is the reduction in noise. As most noise is amplitude based, this can be removed by running the signal through a limiter so that only frequency variations appear. This is provided that the signal level is sufficiently high to allow the signal to be limited.
- **Resilient to signal strength variations:** In the same way that amplitude noise can be removed, so too can any signal variations. This means that one of the advantages of frequency modulation is that it does not suffer audio amplitude variations as the signal level varies, and it makes FM ideal for use in mobile applications where signal levels constantly vary. This is provided that the signal level is sufficiently high to allow the signal to be limited.
- **Does not require linear amplifiers in the transmitter:** As only frequency changes are required to be carried, any amplifiers in the transmitter do not need to be linear.
- **Enables greater efficiency than many other modes:** The use of non-linear amplifiers, e.g. class C, etc means that transmitter efficiency levels will be higher - linear amplifiers are inherently inefficient.

There are a number of dis-advantages to the use of frequency modulation. Some are can be overcome quite easily, but others may mean that another modulation format is more suitable.

- **Requires more complicated demodulator:** One of the minor disadvantages of frequency modulation is that the demodulator is a little more complicated, and hence slightly more expensive than the very simple diode detectors used for AM. Also requiring a tuned circuit adds cost. However this is only an issue for the very low cost broadcast receiver market.
- **Some other modes have higher data spectral efficiency:** Some phase modulation and quadrature amplitude modulation formats have a higher spectral efficiency for data transmission than frequency shift keying, a form of frequency modulation. As a result, most data transmission systems use PSK and QAM.
- **Sidebands extend to infinity either side:** The sidebands for an FM transmission theoretically extend out to infinity. To limit the bandwidth of the transmission, filters are used, and these introduce some distortion of the signal

Infrared systems are often used in the home with TV sets, but, like FM systems, they can also be used in large settings like theaters. With an infrared system, sound from the TV is transmitted using infrared light waves. This sound is transmitted to the listener receiver, which they can adjust their desired volume. The TV can be set to a volume comfortable for any other viewers with normal hearing. Thus, TV watching as a family becomes pleasurable for all

Advantages:

- Listener/user will not hear unwanted radio signals with an infrared system like listener/user might with an FM system

- Listener/user can wear the receiver in many different ways. For example: If Listener/user wants to listen through hearing aids, they can wear a body receiver or a neck loop
- If Listener/users do not want to listen through hearing aids, they can wear an under-the-chin receiver with headphones
- Listener/users have more privacy with an infrared system. No one can hear what they are listening to from outside the room because infrared signals cannot travel through walls
- Some conference rooms and movie theaters have infrared receivers that they loan out for personal use

Disadvantages:

- Listener/user cannot use an infrared system outdoors during the daytime. Too much light can affect the infrared light waves
- If a room has a transmitter, listener/user can sit anywhere in the room but nothing can come between the transmitter and the receiver. Infrared light waves cannot travel through walls, people, or objects
- An infrared system is usually not as portable as an FM system

Speech-to-text software is a type of software that effectively takes audio content and transcribes it into written words in a word processor or other display destination. This type of speech recognition software is extremely valuable to anyone who needs to generate a lot of written content without a lot of manual typing. It is also useful for people with disabilities that make it difficult for them to use a keyboard. Speech-to-text software may also be known as voice recognition software.

Although speech-to-text software is commonly sold as a standalone application, it has also been built into newer operating systems for some devices. Most speech-to-text software programs aimed at assisting with transcription focus on recognizing a wide range of vocabulary from a single user or a limited set of users, rather than recognizing a smaller range of vocabulary from a larger user base.

In terms of technical function, many speech-to-text software programs break spoken-word audio down into short "samples" and associate those samples with simple phonemes or units of pronunciation. Then, complex algorithms sort the results to try to predict the word or phrase that was said. Speech-to-text software has improved quite a bit in accuracy and evolved in general functionality to play a larger role in modern communications over digital platforms.

Voice recognition is an alternative to typing on a keyboard. Put simply, you talk to the computer and your words appear on the screen. The software has been developed to provide a fast method of writing on a computer and can help people with a variety of disabilities. It is useful for people with physical disabilities who often find typing difficult, painful or impossible. Voice-recognition software can also help those with spelling difficulties, including users with dyslexia, because recognised words are almost always correctly spelled.

Voice-recognition software programmes work by analysing sounds and converting them to text. They also use knowledge of how English is usually spoken to decide what the speaker most probably said. Once correctly set up, the systems should recognise around 95% of what is said if you speak clearly. Several programmes are available that provide voice recognition. These systems have mostly been designed for Windows operating systems, however programmes are also available for Mac OS X. In addition to third-party software, there are also

voicerecognition programmes built in to the operating systems of Windows Vista and Windows 7. Most specialist voice applications include the software, a microphone headset, a manual and a quick reference card. You connect the microphone to the computer, either into the soundcard (sockets on the back of a computer) or via a USB or similar connection. Then you can begin talking using the following steps.

Text-to-speech (TTS) is an assistive technology that reads digital text aloud. It's sometimes called "read aloud" technology. With a click of a button or the touch of a finger, TTS can take words on a computer or other digital device and convert them into audio. TTS is very helpful for kids who struggle with reading. But it can also help kids with writing and editing, and even focusing.

TTS works with nearly every personal digital device, including computers, smart phones and tablets. All kinds of text files can be read aloud, including Word and Pages documents. Even online web pages can be read aloud. The voice in TTS is computer-generated, and reading speed can usually be sped up or slowed down. Voice quality varies, but some voices sound human. There are even computer-generated voices that sound like children speaking.

Many TTS tools highlight words as they are read aloud. This allows kids to see text and hear it at the same time. Some TTS tools also have a technology called optical character recognition (OCR). OCR allows TTS tools to read text aloud from images. For example, your child could take a photo of a street sign and have the words on the sign turned into audio.

Print materials in the classroom like books and handouts can create obstacles for kids with reading issues. That's because some kids struggle with decoding and understanding printed words on the page. Using digital text with TTS helps remove

these barriers. Since TTS lets kids both see and hear text when reading, it creates a multisensory reading experience.

Depending on the device your child uses, there are many different TTS tools:

- **Built-in text-to-speech:** Many devices have built-in TTS tools. This includes desktop and laptop computers, smart phones and digital tablets and Chrome. Child can use this TTS without purchasing special apps or software.
- **Web-based tools:** Some websites have TTS tools on-site. Also, kids with dyslexia may qualify for a free Book share account with digital books that can be read with TTS. (Book share is a program of Understood founding partner Benetech.) There are also free TTS tools available online.
- **Text-to-speech apps:** Kids can also download TTS apps on smart phones and digital tablets. These apps often have special features like text highlighting in different colors. Some examples include Voice Dream Reader and Claro Scan Pen.
- **Chrome tools:** Chrome is a relatively new platform with several TTS tools. These include Read & Write for Google Chrome and Snap & Read Universal. People can use these tools on a Chrome book or any computer with the Chrome browser.
- **Text-to-speech software programs:** There are also several literacy software programs for desktop and laptop computers. In addition to other reading and writing tools, many of these programs have TTS. Examples include Kurzweil 3000, Claro Read and Read & Write.

Computer-based learning (CBL) is the term used for any kind of learning with the help of computers. Computer-based learning makes use of the interactive elements of the computer applications and software and the ability to present any type of media to the users. Computer-based learning has many benefits, including the advantage of users learning at their own pace and also learning without the need for an instructor to be physically present. Computer-based learning is also known as computer-aided instruction.

The computer-based learning model can be used by a myriad of learning programs across the world. It can also be combined with traditional teaching methods to enhance the overall educational and training experience. As far as organizations are concerned, computer-based learning could help in training employees in a more effective and profound manner. Individual courses can be imparted in a cost-effective manner to learners.

Computer-based learning is mainly used in:

- Knowledge-based training and assessment
- Simulation-based learning and training
- Creative and instructional games
- Problem-solving training

There are many advantages associated with computer-based learning. It provides more learning opportunity for people from disadvantaged environments. People can learn at a pace comfortable for them, unlike in a traditional classroom. Users need to spend only the required time to learn the subject in the case of computer-based learning, and it is also available all the time. Computer-based learning is cost effective in many ways, as it reduces travel time and also the same application can be used to teach new students or users. The learning also offers

safety and flexibility as well as helps learners to track their progress. Another big advantage is in the reduction of overall training time.

There are, however, some drawbacks associated with computer-based learning. Students do not have the opportunity for physical interaction with the instructors. Development of computer-based learning can be time consuming. The software or the hardware required for learning can be expensive. Furthermore, not all subjects or fields can be supported or assisted by computer-based learning.

A self-learning package is a document containing all that is necessary for a student to attain one or more educational objectives independently of the teacher. Using these packages, the student can take over a large part of his training, while the teacher remains available when needed.

Multimedia is content that uses a combination of different content forms such as text, audio, images, animations, video and interactive content. Multimedia contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or hand-produced material. Multimedia can be recorded and played, displayed, interacted with or accessed by information content processing devices, such as computerized and electronic devices, but can also be part of a live performance. Multimedia devices are electronic media devices used to store and experience multimedia content.

Multimedia presentations may be viewed by person on stage, projected, transmitted, or played locally with a media player. A broadcast may be a live or recorded multimedia presentation. Broadcasts and recordings can be either analog or digital electronic media technology. Digital online multimedia may be downloaded or streamed. Streaming multimedia may be live or on-demand. Multimedia games and simulations may be used in a physical environment with

special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator.

The various formats of technological or digital multimedia may be intended to enhance the users' experience, for example to make it easier and faster to convey information Or in entertainment or art, to transcend everyday experience. Enhanced levels of interactivity are made possible by combining multiple forms of media content. Online multimedia is increasingly becoming object-oriented and data-driven, enabling applications with collaborative end-user innovation and personalization on multiple forms of content over time. Examples of these range from multiple forms of content on Web sites like photo galleries with both images (pictures) and title (text) user-updated, to simulations whose coefficients, events, illustrations, animations or videos are modifiable, allowing the multimedia "experience" to be altered without reprogramming. In addition to seeing and hearing, haptic technology enables virtual objects to be felt. Emerging technology involving illusions of taste and smell may also enhance the multimedia experience.

4.5 Technology Based Education Services: online-learning, Web based learning, Computer assisted Learning, video remote interpreting, C- print technology, open, close and real time captioning.

Technology integration is the use of technology tools in general content areas in education in order to allow students to apply computer and technology skills to learning and problem-solving. Generally speaking, the curriculum drives the use of technology and not vice versa. Technology integration is defined as the use of technology to enhance and support the educational environment. Technology integration in the classroom can also support classroom instruction by creating opportunities for students to complete

assignments on the computer rather than the normal pencil and paper. Technology integration in class would help students to explore more.

Integrating technology with standard curriculum can not only give students a sense of power, but also allows for more advanced learning among broad topics. However, these technologies require infrastructure, continual maintenance and repair – one determining element, among many, in how these technologies can be used for curricula purposes and whether or not they will be successful. Examples of the infrastructure required to operate and support technology integration in schools include at the basic level electricity, Internet service providers, routers, modems, and personnel to maintain the network, beyond the initial cost of the hardware and software.

Technology integration alongside standard education curriculum can provide tools for advanced learning among a broad range of topics. Integration of information and communication technology is often closely monitored and evaluated due to the current climate of accountability, outcome based education, and standardization in assessment.

Technology integration can in some instances be problematic. A high ratio of students to technological device has been shown to impede or slow learning and task completion. In some, instances dyadic peer interaction centered on integrated technology has proven to develop a more cooperative sense of social relations. Success or failure of technology integration is largely dependent on factors beyond the technology. The availability of appropriate software for the technology being integrated is also problematic in terms of software accessibility to students and educators. Another issue identified with technology integration is the lack of long-range planning for these tools within the educative districts they are being used.

Technology contributes to global development and diversity in classrooms and helps develop upon the fundamental building blocks needed for students to achieve more complex ideas. In order for technology to make an impact within the educational system, teachers and students must access to technology in a contextual matter that is culturally relevant, responsive and meaningful to their educational practice and that promotes quality teaching and active student learning. Following the moment when educators realize their students are capable, independent technology users who can create inspiring digital masterpieces. In the former mindset of teaching with technology, the teacher was the focal point of the classroom, creating (often time-consuming) interactive and multimedia presentations to add shock and awe to his or her lessons and capture the attention of the 21st century child.

A new mindset of teaching through technology must emerge, which depends on a vital shift in teacher/student roles. This helps both student and teacher simultaneously. The four Cs are at the heart of the International Society for Technology in Education's National Educational Technology Standards (NETS) for Students, providing a substantial framework for defining the focus of technology objectives for K-12 students. For example, in implementing these standards it have been found that even our youngest 21st century learners are capable of independently creating digital storybooks, artwork, presentations, and movies.

An online learning course is one you take without meeting a teacher in a classroom. You can study at home or at work - wherever you like, whenever you like, within a prescribed time frame. The courses have a set schedule and are delivered over a 14 week period. Most courses do not require that you be online at

a certain time of day or night, but that you are active in the course during the schedule. You cannot start courses late nor finish early.

Online learning is a way of studying for an internationally recognized qualification without needing to attend classes on campus. It is aimed at those who wish to study for a postgraduate qualification alongside work or other commitments, online programmes are of equal value to on campus programmes in terms of entry criteria and overall workload. The only difference is in the way the course is delivered. To study online programme, students will usually only need a computer with internet access. As an online learning student, students will :

- Earn an internationally recognized degree
- Be able to study anywhere
- Have the flexibility to study when its most convenient to them
- Be taught by academics working at the leading edge of their field
- Become part of a rich and varied online community
- Have access to university support services

If one prefer to study at his/her own pace in the comfort of his/her home or office, or if one live a distance from campuses, these courses are for them. Although online learning is a convenient way to take courses, it is not necessarily suited to all students. Some students find it difficult to study independently and need the face to face interaction with the instructor and students that is found in a classroom setting. Online learning students must have self-discipline and excellent reading, writing, and analytic skills.

Benefits of online learning:

- Work in the comfort of your own home or office

- Cost Efficient – no need to travel to the college, and no parking or babysitting expenses
- Courses fit into life, family and work schedule
- Avoid late arrivals to class or class distractions
- Enables the opportunity to ask questions spontaneously
- Instructors are accessible and approachable
- Students have access to their course 24/7
- May be less intimidating than in a classroom setting
- Students are able to enhance their technology and Internet skills
- Accommodates different learning styles using a variety of delivery methods

Disadvantages of Online Learning:

- Only in a small group a person can develop properly. At school, students learn how to make friends, be patient, get rid of disappointment, and especially to compete. Competition between colleagues can be very stimulating and students will only benefit from it. **Online learning** cannot offer human interaction.
- Another disadvantage refers to the fact that online courses cannot cope with thousands of students that try to join discussions. Also, online learning can be difficult, if it is meant for disciplines that involve practice.
- In conclusion, online learning should be seen as a complement and extension of classical forms of learning. Not even the best online course can fully replace the personal contact with a teacher, or the human relationships that

develop in a group. So, traditional classes shouldn't be replaced with online learning.

Web-based learning has got much attention as being an incredible opportunity to study nowadays. Despite of its popularity the notion still remains unclear and confusing. First of all it has many names. You have probably heard the following terms: online learning, e-learning, computer-based training, technology-based instruction etc. Generally the meaning and the basic concept of them are the same. Web-based learning is one way to learn, using web-based technologies or tools in a learning process. In other words, learner uses mainly computers to interact with the teacher, other students and learning material. Web-based learning consists of technology that supports traditional classroom training and online learning environments. "Pure" web-based courses are wholly based on computer and online possibilities. In this case all the communication and learning activities are done online. On the other hand, web-based courses may have some face-to-face sessions besides the distant learning tasks. In this case they are called blended courses as they blend web-based activities with face-to-face activities.

Web-based learning can be also formal or informal. Formal web-based learning is purposed and learning activities are organised by teachers. Informal learning takes place while you are searching material from the Internet. It is self-paced, depending on your goals and ambition to learn.

Generally, web-based learning and traditional learning are similar in terms of desired goals: to acquire new knowledge and skills. In both ways the teacher is mentoring and students are doing various learning activities. Differences between them are seen when we take a closer look at learning activities and tools, teaching approaches, communication issues, etc. The biggest difference between web-based

learning and traditional learning is in communication issues. Web-based learning offers many opportunities for interaction with both fellow students and instructors. Communication can take place via various communication tools such as e-mail, telephone, chat etc. In a traditional way of learning communication and interaction take place mostly at the same time and place as face-to-face meetings. You can learn more about communication on the web in the fourth part of this material.

Due to the distance between the teacher and students in a web-based learning new learning and teaching approaches are needed. Web-based learning enables learner-centred approach. Learning is seen as an active construction of meaning. The main idea behind teaching is to guide and facilitate learning. Group work and independent learning are at the same time the key words of web-based learning. In traditional learning teacher-centred approach is more common, teacher giving/providing knowledge and students passively receiving it.

Prerequisite for using new approaches is changes of roles of teachers and students. In web-based learning, the teacher is a motivator who encourages and supports students in independent and group work activities. Teacher should be an organiser who plans learning activities to support students in learning process. In addition, teacher has to be a mentor who guides and tutors students through learning material and learning tasks. Students are active in their learning process. Students should construct their own knowledge and organise their learning. Furthermore, they should be able to adopt new technology-based learning tools and approaches. As a result from new teaching and learning approaches student assessment in web-based courses is also different. In a classroom setting it is usual to have an oral or written exam after the course. Web-based learning assumes different learning tools compared to classroom learning. Modern technology

(computers, CD, audio, video, PDA, mobile) is used to create suitable learning environments, disseminate information and carry out various learning activities.

Web-based learning has both advantages and disadvantages. When comparing them, one can notice that the same factors can be advantages as well as disadvantages depending on the context.

Advantages:

- New learning theories and approaches enable to learn and teach in a more effective way. Students can experience a sense of equality. Course work and challenging assignments are stimulating for knowledge building.
- Students can work at their own pace, when they want. Web-based learning enables to study more deeply areas of interest. It encourages exploring material on your own and enables to skip over materials already mastered. Web-based learning supports personalised learning and is self-directed. It builds self-knowledge and self-confidence and encourages students to take responsibility for their own learning.
- Web-based learning enables to join discussions at any hour and encourages also those who don't like to speak. It facilitates learning through a variety of activities. Learners have access to courses, which enables to reduce travel time and costs.
- Web-based learning provides interaction between students and instructors. Students can share their ideas with other students, which may help to understand the material better.
- Students can study anywhere and anytime if they have an access to computer and Internet. Web-based learning provides continual and also direct access to materials, resources in many different formats and of good quality.

- Working on the web offers an opportunity to communicate with students using e-mail, discussion boards etc. Teachers receive students' work quickly and they provide timely feedback to students' questions.
- When you learn to use one browser and certain software, you will probably be able to use other browsers and software as well. Some of the software and web browsers are free of charge on the internet. Web-based learning develops knowledge of the Internet and computer skills that help learners throughout their lives and careers.

Disadvantages:

- Teachers and learners have to adopt new learning theories and approaches. Role changes of teachers and learners may cause frustration and confusion. Without the common structures of a traditional class, students may feel lost or confused about course activities and deadlines.
- Learners who are not self-motivated, self-directed and independent are not able to plan their own learning and may have problems. Material and assignment instructions might be too complicated to understand independently. Some of the students may lose motivation without certain deadlines. Independent learning requires certain skills: technological, communication skills, self-motivation and effective study habits.
- Learners with low motivation or bad study habits may fall behind. They may have difficulties in organizing their learning.
- Prohibits those who are not active learners in a group. Human contact is missing as interaction is relied on electronic communication.
- Problems with technology might prevent the access: low speed connection, difficulties to download information, problems with communication tools.

Some courses and materials might be out of date. There may be lack of quality control.

- Teachers are overloaded with students and their contacts. Students may feel isolated from the instructor and classmates. Instructor may not always be available when students are studying or need help.
- Managing computer files and online learning software can be complex for students with beginner-level computer skills. Poor usability may cause troubles with navigation, computers crash or have viruses, impossible to send mails. Software and access to the Internet and e-mail is not free all the time.

Computer-assisted learning (CAL) any use of computers to aid or support the education or training of people. CAL can test attainment at any point, provide faster or slower routes through the material for people of different aptitudes, and can maintain a progress record for the instructor. Computer-assisted learning is one of several terms used to describe this application of computers. Other terms include computer-aided (or -assisted) instruction, CAI, computer-based learning, CBL, and computer-managed instruction, CMI.

Advantages:

- CAL is individualized, that is each student is free to work at his own place, totally unaffected by the performance of any other students.
- Information is presented in a structured form. It proves useful in the study of a subject where there is hierarchy of facts and rules.
- CAL forces active participation on the part of the student, which contrasts with the more passive role in reading a book or attending a lecture.

- CAL utilizes a reporting system that provides the student with a clear picture of his progress. Thus students can identify the subject areas in which they have improved and in which they need improvement.
- By enabling students to manipulate concepts directly and explore the results of such manipulation, it reduces the time taken to comprehend difficult concepts.
- CAL offers a wide range of experiences that are otherwise not available to the student. It works as multimedia providing audio as well as visual inputs. It enables the student to understand concepts clearly with the use of stimulating techniques such as animation, blinking, graphical displays etc.
- CAL provides a lot of drilling which can prove useful for low aptitude students and through which high-aptitude students can be escaped.
- CAL can enhance reasoning and decision-making abilities.

Disadvantages:

- CAL packages may not fulfill expectations of teachers. Objectives and methods decided by the CAL author and of a teacher may differ.
- Motivating and training teachers to make use of computers in education is a challenging task. They may have fear of this new device. They may be unwilling to spend extra time for preparation, selection and use of CAL packages. It may also be perceived as a threat to their job.

- There are administrative problems associated with computer installation. The problems particularly related to the physical location of the computer resources, the cost of hardware maintenance and insurance and time-tabling.
- The rapid development of hardware makes it difficult to select a system before it becomes obsolete. If a new system is installed by a maximum number of institutions, they may not get courseware required for the system and courseware developed so far may become useless.

Video remote interpreting (VRI) is a video telecommunication service that uses devices such as web cameras or videophones to provide sign language or spoken language interpreting services. This is done through a remote or offsite interpreter, in order to communicate with persons with whom there is a communication barrier. It is similar to a slightly different technology called video relay service, where the parties are each located in different places. VRI is a type of telecommunications relay service.

Video remote interpreting is a form of sign language interpreting that allows people who are deaf or hard of hearing to communicate with a hearing person at the same site via video conferencing instead of live, on-site interpreting. VRI is especially useful when there is a lack of available qualified interpreters, such as at a rural location and when an interpreter is needed immediately and there is no available interpreter on-site.

VRI works by using video conferencing equipment at both locations. The interpreter, who is typically at a call center, uses a headset to hear what the hearing person says. As the hearing person speaks, the interpreter signs everything said to a web camera. When the person who is deaf replies via their web camera, the

interpreter sees and voices the interpretation. The person who is deaf and the person who is hearing can talk back and forth, just as if the interpreter was in the same room.

VRI is provided on a fee-for-service basis by several interpreting agencies; costs may vary based on whether an interpreter is needed immediately or is scheduled ahead of time. More information on VRI can be provided by a local sign language interpreting agency, which can be found by searching for "video remote interpreting" on the web. VRI should not be confused with Video Relay Service (VRS), where a telephone conversation between two people at different locations is interpreted.

Advantages:

- **Accuracy** – The visual support associated with Video Remote Interpreting can provide enhanced accuracy for spoken language and American Sign Language (ASL).
- **Non-Verbal Communication** – Seeing the facial expressions of the interpreter via VRI, and knowing they understood what was said and the ability to confirm the meaning of non-verbal communication can enhance the interpreting experience.
- **Immediacy and Connections** – Video Remote Interpreting provides fast connect times for situations requiring immediate connections in which visual communication with the interpreter is necessary, or when a more personal connection will help the conversation.

Limitations:

Technology is improving many aspects of our lives and sign language interpreting is no exception. Video Remote Interpreting, or VRI, can be a wonderful and cost-effective way to access interpreting services on-demand. If at any time the deaf consumer determines that VRI does not provide effective communication, the consumer may choose to decline the use of VRI in medical settings. Some medical situations that may not be conducive for VRI are:

- Some mental health settings
- Initial meetings with a specialist
- Highly sensitive communications (e.g., diagnosis of a serious illness)
- Eye exams
- Some occupational and physical therapy sessions
- Patient transport
- Video quality is distorted due to signal interference with other medical equipment or "dead zones" within a facility
- The video interpreter available is not qualified for the scenario in which they are asked to interpret without preparation time or background knowledge of the patient's situation

Additionally, some situations that might typically work well with VRI will not be appropriate due to the nature or condition of the patient. This could include if the patient:

- Is a child
- Has limited cognitive ability

- Is heavily medicated, intoxicated, or in severe pain
- Is highly emotional and/or presents violent tendencies
- Has a secondary disability, such as low vision
- Has an injury or is undergoing a procedure that prohibits the ability to view the interpreter on a monitor

C – Print is a speech-to-text (captioning) technology and service developed at the National Technical Institute for the Deaf, a college of Rochester Institute of Technology. The system successfully is being used to provide communication access to individuals who are deaf or hard of hearing in many programs around the country. In addition to educational environments, C-print also can be used in business and community settings and with individuals with other disabilities, such as those with a visual impairment or a learning disability.

Open captions appear on your television or computer screen during a program to display spoken dialogue as text. Captions are designed to make it easier for viewers who are deaf or hard of hearing to enjoy a television or online streaming video program. Captions are also useful in noisy places or places where multiple televisions are running different shows simultaneously.

Advantages of Open Captions

- One of the drawbacks to using closed captions is that the viewer must activate them himself: A task which may be difficult for some viewers, and which varies from one television or streaming service to the next. Open captions remove this hurdle and provide their captions at all times. This

makes open captioning more universal, as separate captioning decoders aren't required.

Disadvantages of Open Captions

- Open captions are encoded directly into the video stream of a video, making it impossible to disable them for viewers who don't want or require them. The quality of open captions is also directly tied to the quality of the video: If the video is blurry or otherwise low-quality, the captions are also blurry and may be difficult to read.

Closed captions are a text version of the spoken part of a television, movie, or computer presentation. Closed captioning was developed to aid hearing-impaired people, but it's useful for a variety of situations. For example, captions can be read when audio can't be heard, either because of a noisy environment, such as an airport, or because of an environment that must be kept quiet, such as a hospital.

Captions, composed of text, are used by people who are deaf or hard of hearing to access content delivered by spoken words and sounds. Real-time captions, or Computer Assisted Real-time Translation (CART), are created as an event takes place. A captioner (often trained as a court reporter or stenographer) uses a stenotype machine with a phonetic keyboard and special software. A computer translates the phonetic symbols into captions almost instantaneously and displays them on a laptop or on a large display screen. A slight delay may occur because of the captioner's need to hear and enter the words and the computer's processing time. Real-time captioning can be used for programs that do not have written scripts or captions such as: lectures, classes, congressional or council

meetings, news programs, and non-broadcast meetings, such as those of professional associations.

Remote real-time captions are produced at a remote location and then transmitted to the site where the program is taking place. For example, in a lecture hall an instructor can talk into a microphone that is connected via telephone lines to a captioner in a different city. From that location, the captioner, using similar equipment as described above, transmits the captioned text via the internet, using special software, to a laptop in the lecture hall- or to a laptop in a student's home, if they are unable to attend the lecture in person.

Although most real-time captioning has been estimated to be well over ninety percent accurate, the audience will see occasional errors. The captioner may misunderstand a word, hear an unfamiliar word, or there may be an error in the software dictionary. Captions can also benefit individuals who understand the written better than the spoken word of the language in which a presentation is delivered as well as people who are viewing the program in a noisy (e.g., airport or sports bar) or noiseless (e.g., a work cubicle) environment. Captions that are not "real-time" include those provided on television programming and those made available on prerecorded video that can be rented or purchased.

4.5 ICT and education of children with hearing impairment: Planning, implementation and evaluation of teaching-learning

Information and Communication Technology (ICT) is an extended term for information technology (IT) which stresses the role of 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. There are large economic incentives (huge cost savings due to elimination of the telephone network) to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution and management.

However, ICT has no universal definition, as "the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis." The broadness of ICT 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. Skills Framework for the Information Age is one of many models for describing and managing competencies for ICT professionals for the 21st century.

ICT, or information and communications technology (or technologies), is the infrastructure and components that enable modern computing. Although there is no single, universal definition of ICT, the term is generally accepted to mean all devices, networking components, applications and systems that combined allow people and organizations to interact in the digital world.

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 of ICT 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 TVs and robots, are more recent entries. ICT commonly means more than its list of components, though. 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 present curricula for ICT in Education aims at realizing the goals of the National Policy of ICT in Schools Education and the National Curriculum Framework. Given the dynamic nature of ICT, the curricula, emphasizing the core educational purposes, is generic in design and focuses on a broad exposure to technologies, together aimed at enhancing creativity and imagination of the learners.

For the teacher, it is an initiation into:

- Learning to make right choices of hardware, software and ICT interactions
- Exploring educational possibilities of technology,
- Growing to become a critical user of ICT

For the student, it is an initiation into:

- Creativity and problem solving

- An introduction to the world of information and technologies
- An opportunity to shape career pursuits

The Information and Communication Technology (ICT) in schools have been subsumed in the Rashtriya Madhyamik Shiksha Abhiyan (RMSA). Now ICT in Schools is a component of the RMSA. The Information and Communication Technology (ICT) in Schools was launched in December, 2004 and revised in 2010 to provide opportunities to secondary stage students to mainly build their capacity on ICT skills and make them learn through computer aided learning process. The Scheme is a major catalyst to bridge the digital divide amongst students of various socio economic and other geographical barriers. The Scheme provides support to States/UTs to establish computer labs on sustainable basis.

The scheme has essentially four components:

- The first one is the partnership with State Government and Union Territories Administrations for providing computer aided education to Secondary and Higher Secondary Government and Government aided schools
- The second is the establishment of smart schools, which shall be technology demonstrators
- The third component is teacher related interventions, such as provision for engagement of an exclusive teacher, capacity enhancement of all teachers in ICT and a scheme for national ICT award as a means of motivation
- Fourth one relates to the development of a e-content, mainly through Central Institute of Education Technologies (CIET), six State Institutes of Education Technologies (SIETs) and 5 Regional Institutes of Education (RIEs), as also through outsourcing

The scheme currently covers both Government and Government aided Secondary and Higher Secondary Schools. Financial assistance is provided for procurement of computers and peripherals, educational software, training of teachers, development of e-content, Internet connectivity & set up of smart schools. So far, 87033 government and government aided secondary and higher secondary schools have been approved for coverage under ICT in Schools Scheme.

Under the existing Information Communication Technology in School Scheme as against the target of setting up of 150 more such schools, this Ministry has approved for coverage of 63 Smart School so far. The Smart Schools are being established in the Districts by conversion of one of the existing State Government schools to serve as a role model and Technology Demonstrator among the neighbourhood schools. Under the ICT in Schools, to promote computer enabled learning and usage of ICT in teaching in Government and Government aided Secondary and Higher Secondary Schools has provision for instituting the National Award for innovative use of ICT to motivate the Teachers and Teacher Educators for innovative use of ICT in teaching-learning. The National Award for Teachers using ICT for innovation in education for the year 2010, 2011, 2012 and 2013 was given away to the 9 awardees along with the National Teacher Award on Teachers Day.

ICT is of particular value in developing the language experiences of learners with HI. ICT can be a very visual medium, with pictures, signs or texts on screen allowing pupils to extend both their general knowledge and use of language without being dependent on the spoken word. Learners who have a HI often need opportunities to extend their use of descriptive language in order to describe, compare and contrast objects: all skills that underlie effective information handling. Collaborating on an ICT activity can encourage a group of students to

extend their use of language and their understanding of concepts as they plan and carry out their work.

The types of technology which are of most benefit to those with HI include:

- CD-ROM
- Control software
- Data logging
- Logo or turtle graphics
- Multimedia
- White boards

CD-ROM technology can provide hearing-impaired students with access to information in a more immediate and visual form than was previously possible. The opportunity to create multimedia presentations, by combining text, pictures and sound, can enable students to experiment with different methods of combining sound and vision. Where appropriate, the sound output can be linked to the enhanced amplification used by the student. These sounds become more meaningful when heard in conjunction with moving images on screen. ICT can provide a first-hand experience to supplement and extend students' work without the students being dependent on text for structuring their ideas. For example, control software can be used to allow students to create and control a burglar alarm using a control box attached to the computer. Data logging software enables students to monitor the change in temperature of water in a beaker through sensors attached to the computer. Logo or turtle graphics provide a means of directing a floor robot or turtle through a maze by sending a series of instructions from the computer. Because all these are 'visual' as opposed to 'aural' there is less chance of misunderstanding.

It is important for all those working with the student to agree on the rationale for using an ICT solution. Training opportunities and time for liaison and review need to be considered if the use of ICT for an individual child is to be fully effective. An ICT solution must be matched to the needs of the individual. Physical difficulties, poor motor control or visual impairment can all combine with HI to affect the educational objectives for the student and thus influence the role of ICT in their learning. A full assessment of the child's strengths and weaknesses in the context of the classroom is an essential first step.

Becta and BT worked with Deaf@x to develop literacy skills in deaf children by partnering them with a hearing adult. The original project targeted seven schools and one college. Writing and communicating need to be an active process, and people talk and write better if they have a receptive audience and get some feedback. Staff reported improvements in grammar, drafting skills, syntax, punctuation and vocabulary. Social interaction became important. Many were writing to an adult as an equal for the first time, using language to convey and elicit information. In many cases they were exchanging personal information and asking questions instead of always trying to answer them! Now Deaf@x are working with children in India in a two-year programme to share good practice in the UK between teachers, parents and experts in the fields of literacy and total communication. They will be linking up to explore the use of telecommunications and the Internet to train deaf children to improve the literacy and communication skills of deaf children around the globe. When you think that in the past some BSL users never communicated with anyone who was not in the same room as them, it is amazing the difference that technology has made.

The National Programme on School Standards and Evaluation (NPSSE), known as Shaala Sidhhi is a comprehensive instrument for school evaluation

leading to school improvement. Developed by the National University of Educational Planning and Administration (NUEPA), it aims to enable schools to evaluate their performance in a more focused and strategic manner and facilitate them to make professional judgments for improvement. The programme's objective is to establish and refer to an agreed set of standards and to provide clear pathways for each school for self evaluation, by focussing on key performance domains and their core standards for school evaluation. The structure of the Framework is simple yet flexible and lends itself to both self and external evaluation. A web portal for the framework has been launched by Hon'ble HRM on 7.11.2015 which will enable all schools to engage in self-evaluation in the 7 key domains under the Framework. The results of the evaluations will be available on a public platform along with the school report card.

E-Pathshala has been developed by NCERT for showcasing and disseminating all educational e-resources including textbooks, audio, video, periodicals and a variety of other print and non-print materials through website and mobile app. The platform addresses the dual challenge of reaching out to a diverse clientele and bridging the digital divide (geographical, socio-cultural and linguistic), offering comparable quality of e-contents and ensuring its free access at every time and every place. All the concerned stakeholders such as students, teachers, educators and parents can access e-books through multiple technology platforms i.e. mobile phones (android, ios and windows platforms), and tablets (as e-pub) and on web through laptops and desktops (as flipbooks). All the NCERT books have been digitised and uploaded. Currently the e-contents are available in Hindi, English and Urdu. States/ UTs are being approached to digitise and share all textbooks in Indian languages through this platform, which will be done in a phased manner. The Web portal and Mobile App of e-Pathshala was launched by

Hon'ble HRM during the National Conference on ICT in School Education on 7th November, 2015.

The first phase of "Shaala Darpan Project" to cover all the 1099 Kendriya Vidyalayas was launched on 05.06.2015. The same is presently under implementation through National Informatics Centre Services Inc. (NICSI). The objective of this project is to provide services based on School Management Systems to Students, Parents and Communities. The School Information Services includes School Profile Management, Student Profile Management, Employee Information, Student Attendance, Leave Management, Report Cards, Curriculum Tracking Custom, SMS Alerts for Parents / Administrators on student & teacher attendance.

With a vision to "Improve children's education by enhancing interaction between schools as well as parents and providing data driven decision support system to assist them in taking best decisions for their children's future", Central Board of Secondary Education (CBSE), has developed, a decision support system called 'Saransh'. This tool allows schools to identify areas of improvement in students, teachers and curriculum and take necessary measures to implement change by comparison of results. The mobile App for Saransh has been launched by Hon'ble HRM on 7.11.2015 at the National Conference on ICT. This will enable the parents and students also to look at and compare their results vis-a-vis school, state and national level. "Saransh" has also been conferred with the e-India 2015 Award for 'Best Government Initiative in Education', SKOCH Order of Merit for 'Smart Project' and SKOCH AWARD (Highest Independent Honour).

All states have conducted GIS mapping and shared geographical coordinates of schools with the NIC except the State of Jammu and Kashmir. This mapping has

been linked to the UDISE data base to ensure that every school is mapped and is backed by a detailed school report card based on UDISE information. This effort of developing web enabled platform about school information (Spatial and Non Spatial data) will add to the quality of planning and better utilization of resources available under SSA and RMSA. GIS mapping of 11,29,250 schools (73.41%) across the country has been completed so far.

4.6 Future Technologies: Universal Design: Meaning & scope

Hearing aids have been around for centuries, but they weren't always as high-tech and sophisticated as the ones now available. While horn-style devices were popular back in the 1800s, the first electrical hearing aid was created in 1898, which led to hybrid aids using combined digital and analogue circuitry being patented in 1977. Digital signal processing chips also revolutionized the hearing aid industry and these days you only have to visit a site like Hidden Hearing to see sleek inner ear models that offer those with hearing impairments a more discreet alternative. Technology has greatly enhanced the hearing aid world, but what's next? Here are five bits of future hearing technology, might expect to see over the coming years:

➤ **Ear-lens**

Currently at clinical trial stage, the ear-lens could soon be a common form of treatment for those with hearing problems. Essentially, it's a transducer mounted on the eardrum that receives a laser signal from the external part of the aid mounted behind the ear. The transducer converts the laser signal into a physical vibration on the eardrum itself and has a much wider frequency range than many of the more conventional hearing devices.

➤ **Inductive charging hearing aids**

Within the next five to ten years, might expect to see hearing aids that are fully implanted into the ear meaning the user won't have to worry about taking it in or out or adjusting the settings. But how will it stay charged, these innovative devices will use inductive charging which quite literally means that the energy from the human body will be enough to keep it working.

➤ **Hearing aids connected to audio products**

It's thought that somewhere down the line, hearing aids will be wirelessly connected to a wide range of audio devices thanks to digital wireless technology being imbedded into various household devices. If a television was transmitting its audio wirelessly, for instance, then a wireless receiver could be added to the hearing aid so that a hearing aid user can listen to television audio that is not subject to room vibration. On a similar note, hearing aid companies are already creating Bluetooth accessories that plug into a hearing aid's direct audio input. These accessories provide wireless links between the hearing aid and cell phone devices making it easier for the user to hear what's being said.

➤ **Smartphone compatible hearing aids**

Imagine a world where hearing aids are connected to your smart phone! Well, this might not be too far off as the idea is already floating around. If you need directions, for instance, you wouldn't have to look at your map or phone to find out where to go as they could be spoken directly into your ear via your hearing device. Similarly if you got a call on your phone, it could be synched up with your hearing aid allowing you to hear the person speaking clearly. And this kind of tech is not exclusive to hearing aids only as it could work for other in-ear devices.

➤ **Ear-to-ear connectivity**

Hearing aids for individual ears are often considered separate entities, but wireless technology will help hearing devices for the left and right ear become more synchronised. While this functionality has already been introduced into the industry with the synchronisation of volume controls, the process will become a lot smoother with a pair of hearing aids being considered a single system.

Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability. An environment should be designed to meet the needs of all people who wish to use it. This is not a special requirement, for the benefit of only a minority of the population. It is a fundamental condition of good design. If an environment is accessible, usable, convenient and a pleasure to use, everyone benefits. By considering the diverse needs and abilities of all throughout the design process, universal design creates products, services and environments that meet people's needs. Simply put, universal design is good design.

Universal design (close relation to inclusive design) refers to broad-spectrum ideas meant to produce buildings, products and environments that are inherently accessible to older people, people without disabilities, and people with disabilities. The term "universal design" was coined by the architect Ronald L. Mace to describe the concept of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life. However, it was the work of Selwyn Goldsmith, author of *Designing for the Disabled* (1963), who really pioneered the concept of

free access for people with disabilities. His most significant achievement was the creation of the dropped curb - now a standard feature of the built environment.

Universal design emerged from slightly earlier barrier-free concepts, the broader accessibility movement, and adaptive and assistive technology and also seeks to blend aesthetics into these core considerations. As life expectancy rises and modern medicine increases the survival rate of those with significant injuries, illnesses, and birth defects, there is a growing interest in universal design. There are many industries in which universal design is having strong market penetration but there are many others in which it has not yet been adopted to any great extent. Universal design is also being applied to the design of technology, instruction, services, and other products and environments.

Curb cuts or sidewalk ramps, essential for people in wheelchairs but also used by all, are a common example. Color-contrast dishware with steep sides that assists those with visual or dexterity problems are another. There are also cabinets with pull-out shelves, kitchen counters at several heights to accommodate different tasks and postures, and, amidst many of the world's public transit systems, low-floor buses that "kneel" (bring their front end to ground level to eliminate gap) and/or are equipped with ramps rather than on-board lifts.

Designing any product or environment involves the consideration of many factors, including aesthetics, engineering options, environmental issues, industry standards, safety concerns, and cost. Often, products and environments are designed for the average user. In contrast, UD is "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" . For example, a standard door is not accessible to everyone. If a large switch is installed, the door becomes accessible to more people, including some wheelchair users. Applying UD principles could lead

to the installation of sensors that signal the door to open when anyone approaches, making the building accessible to everyone a small child, a man carrying a large box, an elderly woman, a person using a walker or wheelchair.

When designers apply UD principles, their products and environments meet the needs of potential users with a variety of characteristics. Disability is just one of many characteristics that an individual might possess. For example, one person could be five feet four inches tall, female, forty years old, a poor reader, and deaf. All of these characteristics, including her deafness, should be considered when developing a product or environment she and others might use. The goal of UDI is to maximize the learning of students with a wide range of characteristics by applying UD principles to all aspects of instruction (e.g., delivery methods, physical spaces, information resources, technology, personal interactions, and assessments).

Making a product or environment accessible to people with disabilities often benefits others. For example, sidewalk curb cuts, designed to make sidewalks and streets accessible to those using wheelchairs, are today often used by kids on skateboards, parents with baby strollers, and delivery staff with rolling carts. When television displays in noisy areas of airports and restaurants are captioned, they are more accessible to people who are deaf and everyone else.

Universal Design Principles:

- Equitable use: The design is useful and marketable to people with diverse abilities. Example: A professor's website is designed so that it is

accessible to everyone, including students who are blind and using text-to-speech software.

- Flexibility in use: The design accommodates a wide range of individual preferences and abilities. Example: A museum, visited as a field trip for a course, allows each student to choose to read or listen to a description of the contents of display cases.
- Simple and intuitive use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level. Example: Control buttons on science equipment are labeled with text and symbols that are simple and intuitive to understand.
- Perceptible information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. Example: A video presentation projected in a course includes captions.
- Tolerance for error: The design minimizes hazards and the adverse consequences of accidental or unintended actions. Example: Educational software provides guidance and background information when the student makes an inappropriate response.
- Low physical effort: The design can be used efficiently, comfortably, and with a minimum of fatigue. Example: Doors to a lecture hall open automatically for people with a wide variety of physical characteristics.
- Size and space for approach and use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility. Example: A flexible science lab work area has adequate workspace for students who are left- or right-handed and for those who need to work from a standing or seated position.

Universal Design Scope:

- Universal Design helps teachers plan learning to meet the diverse and variable needs of all students. Flexible supports for learning can be embedded into an environment and made available to everyone. Hidden barriers to learning can be identified and minimised. Universal design can be used beyond the classroom to underpin the design of more inclusive home-school communications, professional learning options, and community events.
- Universal Design for learning helps teachers optimize their teaching and learning. Use it to create a more inclusive, flexible environment, where barriers to learning are minimized with supports and options available to all students.
- Overview of the value of using captioned or subtitled videos to support literacy across the curriculum. Provides all students with alternative access to content in videos.

4.7 Let Us Sum UP

Lot of modern technology is ideally suited for deaf culture. Text and instant messaging, for example, are beneficial to deaf people because they allow conversation between people regardless of whether or not they are deaf and they do not require the use of sign language. However, with in the deaf community not everyone is accepting or open to technology bridging the gap between the hearing and the non-hearing. There are two groups within the community with differing opinions on the matter. There are people who refers to themselves as deaf with the

lower case “d” and there are the deaf with a capital “D”. The deaf group is one that takes pride in traditional forms of communication amongst deaf people and limits the use of technology as a way of communicating. For the deaf, technology enhances deaf culture and is positively looked upon.

Deafness can have a major impact when it comes to learning, which makes deaf education an area that greatly benefits from the use of technology. When in a classroom environment, speech-to-text systems can prove beneficial to students without hearing. These systems convert spoken words into real-time, displayed text that students can read on their computers or on a screen that is displayed to the class. In addition to the real-time display of text, these systems also provide a print out or text file of the lecture.

4.8 Check your progress

1. Explain the changing trends in teaching and learning.
2. Elaborate the technological impact on education.
3. Discuss about Information and communication technology and its impact on education of children with hearing impairment.
4. What is Universal Design? Explain its meaning and scope.
5. Briefly explain about the future technologies.
6. Write a short note on multimedia.
7. Broadly discuss technological products for educational purposes like listening, visual and audio-visual.
8. Point out in details various technology based educational services.

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