EDUCATIONAL TECHNOLOGY AND ICT

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Lecture-21

Module-21: Basics of ICT

Hello dear learner, welcome to SWAYAM-NPTEL course on Educational Technology and ICT. I am Dr. Sarita Anand from the Department of Education, Vinaya Bhavana, Visva-Bharati, Santiniketan, West Bengal, India. I am the course coordinator for this course, and today we will deal with Module 21 on the basics of ICT. This is Lecture 21. We have already covered the concepts like technological trends in communication, social media platforms, messaging apps and instant communication, video conferencing and virtual meetings, AI in communication, and smart devices for communication.

Now, we will talk about the basics of ICT. We know that today's world, where we live, is a knowledge-driven society and a global environment where knowledge is a source of immense power, economic value, and individual strength, as well as the vital asset of the nation: information. The rapid expansion of knowledge, both in terms of quality and growth, demands new technologies to access and utilize it effectively and efficiently. However, merely acquiring knowledge is not sufficient.

It is essential to have complete access to and mastery over the process of acquiring and managing this knowledge. This can only be achieved with the support and help of information and communication technology. Thus, ICT incorporates the tools, equipment, and applications that facilitate the efficient collection, storage, retrieval, transmission, manipulation, and dissemination of information. ICT plays an important role in enriching knowledge, improving communication, and enhancing decision-making and problem-solving skills.

It is an essential technology that integrates information and communication to support the knowledge acquisition process effectively. To understand the basics of ICT, we must know the origin and the growth of ICT, and how it evolved. Let's do it first. The origin and the

growth of ICT, the practices of communication, collecting, and utilizing information have existed since the dawn of human civilization. In early times, these activities were carried out orally, with information stored in memory and passed on verbally.

The invention of paper and ink marked a significant breakthrough in ICT, allowing information to be documented and preserved. But before that, ICT-information and communication technology was different, and it evolved day by day. For example, in the ancient Indian education system, memory and memorization were the techniques used for sharing knowledge from one generation to another.

After the scientific growth of inventions like paper and ink, a major advancement came with the movable-type printing press, invented by Gutenberg (1438) in Germany. This revolutionized the dissemination of information through print media. Several scientific and technological developments have further advanced ICT, such as photography, invented in 1849 by L. G. M. Duro and W. H. Talbot of England. These were the English inventors of photography. Then, the photostat machine was developed in the 1990s by Professor Abbe Rene Graffin of France.

Xerography was introduced in 1938 by Carlson in the United States. Micrography, a technique for obtaining highly reduced copies of recorded materials, was created in the 1940s by Dancer of England and Rene Dagran of France. These were the developments regarding the ICT. Later, laser technology came used for printing and memory devices developed in 1960s by Theodore Maiman from US. Next, the magnetic video cameras, video discs and computers. These were the key innovation in 20th century.

It plays the crucial important role in modern ICTs which we are using. These advancements have significantly enhanced the ways of information is created, stored and shared and utilized making ICT a foundation of the contemporary knowledge-based world. The progress in telecommunication technology has significantly shaped the development of ICTs. From the days of delivering message via pigeons, parrots, humanity has advanced to this era of satellite communication.

The notable milestones in this journey include the telegraph invented by Morse from USA (1837), the telephone invented by the Graham Bell (1876), radio by Marconi from Italy (1895), and the television by Bard from Scotland (1925). And the satellite communication and fax technology pioneered the 20th century where the launch of first satellite Sputnik by the USSR on October 4, 1957 was a benchmark. With modern advancement in the

collection of storage, retrieval, transmission and exchange of information, deliberate efforts to establish the scientific control over these processes began in the late 90th century.

The United States and other countries had worked a lot in the field of ICT in terms was initially used, managed to effective exchange of scientific information among the domestic and international scientists. The first information science later on we know that the term ICT was used in 1950s; this term was become famous and we are using till now the term ICT. Initially, the focus of ICT was on managing the bibliographic records and textual information primarily within the scientific sector.

Around 1960s the applications expanded to the industrial domain where computer aided technology or techniques and the system were developed to enhance the efficiency in information and communication. Over the time During developments, ICT's scope extended and beyond science and its industry to include the various fields such as banking, management, education, healthcare, government offices, law, judiciary, police and military establishments were coming forward to use the ICT resources.

Now, the traditional and modern ICTs. We have already told that the ICT is being utilized since ages. Now, we will talk about the traditional and modern ICTs. As discussed earlier, ICTs have been present in various forms since the ancient time. These can broadly be classified in traditional and modern ICTs based on their nature and technological advancement being utilized in that form.

The traditional ICTs, these ICTs refers to the conventional means and media for communication and information dissemination. These include the printed media like textbooks, resource books, journals, news articles and other literature commonly found in school and colleges and higher education institution, public libraries are coming in printed media. The verbal communication, exchanging information and ideas with peers, teachers, parents and the member of the society or the community also is the traditional ICT.

Graphical materials like visual aids such as pictures, charts, maps, diagrams, posters and cartoons are also the traditional ICT. The three-dimensional aids, materials like specimens, models, puppets, mock-ups which we have already seen in our childhood time or you have seen in your schools where the specimens were utilized to teach the physics and chemistry experiments. The audiovisual equipment: Like devices such as radio, television, slide projectors, overhead projectors, motion picture systems, tape recorders, audio visual recording devices and teaching machines are coming under the traditional ICTs.

Now, the modern ICTs: Modern ICTs represent a shift from traditional ICTs single functional technologies to advanced digital systems that combine the hardware, software, media and delivery methods which we had already discussed in our previous lecture. These technologies include the digital devices like video cameras, multimedia PCs, laptops, notebooks, tablets and other smartphones. Application softwares, programs for word processing, spreadsheets, presentation, PowerPoint, simulations and speech recognitions are coming in the modern ICT. Multimedia projectors like LCD projectors used for communication with the large audiences in the teaching.

Networking:Technologies such as local area networking, metropolitan area networking man and the wide area networking van are the modern ICTs. Advanced hardwares like multimedia PCs, laptop equipped with the video cards, web cameras or digital video cameras or having touch screen, having the stylus, these are the modern ICTs. The data processing system, tools for data management like CD ROMs, DVDs, digital libraries, etc. coming in this part. The next one is digital communication platforms.

Digital communication platforms like email, the internet and the worldwide web is the modern ICT. Interactive media. Resources such as hypermedia, hypertext, computer mediated conferencing using the video conferencing or audio conferencing, podcast, etc. are the interactive media. The interactive technology tools like video text, teletext, interactive video disc and interactive remote instructions are coming in this modern ICT.

The visual learning, the virtual learning, concepts such as virtual classroom and virtual reality that enhances the learning experiences is coming under the modern ICT. So, the traditional and modern ICT collectively enable effective communication and education adapting to the needs and involvement of digital society while maintaining the functional led by the earlier technologies. Now, we talk about the basics of information and communication technology. I hope you have got the essence of the basics of educational technology.

Now, directly we will talk about the basics. It refers to the integration of technology for the collection, storage and processing and dissemination of the information. It plays an important role in bridging the gaps of the communication, enhancing the accessibility of information and facilitating efficient interaction in various domains such as education, business, healthcare and governance. There are many fields, but we have given the two, three examples. Now, the basic terms which we are using in the ICT, these are input, processing, output and the storage.

We know that entering data into the computer system, such as typing on a keyboard or scanning a document, is input. The processing uses software and hardware to manipulate and transform data, generating results such as calculations and data analysis. These fall under processing, and the output displaying or communicating data, such as printing a document or sending an email, is the output. Storage involves saving data for later use, such as on a hard drive, a pen drive, or cloud storage, whether it's OneDrive or Google Drive; that comes under storage. Now, the characteristics of ICT.

The basic characteristic is interconnectivity. ICT enables devices and systems to communicate with each other seamlessly. They are interconnected. Accessibility: information can be accessed remotely and in real time, breaking geographical barriers. It provides the facility of efficiency. Automated systems reduce the time and effort in data processing and communication.

Scalability: ICT systems can grow and adapt to meet the increasing demands of the community or the education system. Cost-effectiveness: technologies like video conferencing and cloud storage reduce the expenses associated with travel and physical infrastructure.

Now, the core components of ICT: ICT encompasses tools, systems, and the networks that enable the handling of information and communication. It includes both hardware and software components and can be broadly categorized as hardware, software, and communication networks. We have already discussed hardware and software; the communication network is the system that enables the transmission of data and information, such as the internet. Internet and wireless networks, such as local area networks and wide area networks. Lastly, there is the data. That data should be stored, processed, and communicated through these ICT systems. Now, what are the major tools and applications in ICT? ICT is powered by a variety of tools that can be classified as communication tools, storage tools, media tools, networking tools, learning tools, productivity software, internet, and web.

Lastly, there is multimedia. So, here we can take them one by one. Communication tools include email, messaging apps, video conferencing, and other virtual platforms like Google Meet, Zoom, and Microsoft Teams. Storage tools include cloud services like Google Drive, OneDrive, Dropbox, external drives, and USB devices. Media tools include cameras, microphones, multimedia projectors, and editing software for creating and sharing content.

Networking tools like routers, switches, modems and network cables for building the interconnected systems. Learning tools like LMS, e-books, educational softwares enhancing the classroom learning and training programs or the environment. Productivity softwares like MS Office, Google Docs and Labour Office. The internet and web browsers, search engines, website and online services are coming under these tools and the multimedia images, audios, videos and animations are coming under the multimedia.

Now, I hope you got the major tools, you understand the major tools of the ICT. Now, the function of ICT, how ICT technologies serve multiple functions that simplify and enhance the communication process like data collection and storage. Tools like database and cloud storage allow large amount of data to be saved and retrieved efficiently. Whenever you want, you can retrieve.

Information processing, software enabled organization, analysis and interpretation of data to derive the useful insights can be done by the help of ICTs. Information dissemination. Communication platforms, websites and media outlets ensure that information reaches to a wide audience. The collaboration, ICT fosters teamwork through tools like video conferencing, shared documents and project management software. So, for performing these functions, we need some ICT skills.

Our teacher trainees, the members of the society, need these ICT skills. What are these? The basic computer skills-typing, mouse navigation, and basic software applications awareness are required for ICT skills. Internet and email, browsing, searching, emailing, and online safety awareness are required for the basic functions of ICT.

Productivity software: word processing at least we should know word processing spreadsheets, uses of spreadsheets, and presentations. It means at least we should know Office. Now, the fourth one is digital literacy. Understanding digital concepts, online safety, and digital citizenship and even how to search using a search engine like Google Scholar, Google, or a base search engine we should know having digital literacy.

Now, the areas of ICT application. ICT has applications across various domains, including education. It enhances teaching through digital content, e-books, and multimedia presentations. Facilitating distance learning through online platforms and virtual classrooms. Promoting personalized learning through adaptive software.

The second area is the domain of business. Definitely, ICT applications are being utilized in businesses as well. Even at present, the whole Maha Kumbh is digitized. So,

governments are also utilizing these ICT resources. Streamlining operations with tools like Enterprise Resource Planning (ERP) systems can be utilized.

Enabling online transactions and e-commerce platforms. This is the biggest ICT application in the world, and *Rehdiwala, Thelawala*, and the whole community from society are using these online transactions easily. So, facilitating global communication through video calls and messaging services is being utilized with the help of ICT.

Now, the third one is healthcare. The biggest boom is in the healthcare sector, where electronic health records and telemedicine services are being used with the help of ICT. Diagnostic tools powered by artificial intelligence, like we are using this smartwatch. This is being utilized to take care of our health, such as how many miles I have walked today and what my heart rate is, etc. We can go through by using this ICT. The communication between healthcare professionals using secure platforms through ICT.

The governance is implementing e-governance and a paper-free environment in offices to improve citizen services. Enhancing transparency through open data initiatives. If we are using ICT for communication, governance is going through ICT, everything will be Transparent, strengthening communication between government departments, definitely their collaboration and intercommunication is enhanced with the help of ICT applications. This list is so long, the areas are so vast, that's why I have only taken four examples, and you can go through introspection, think, use your HOT (Higher-Order Thinking), and find out that there are enormous applications of ICT in our daily lives.

Now, the advantages of ICT we have already discussed, though I have pinpointed them. Global connectivity is an advantage. ICT connects people across the globe, fostering communication and collaboration. We are sitting here and can collaborate with people from the US or UK. Access to information: users can retrieve vast amounts of information instantly.

There are no walls, boundaries, or prohibitions. Flexibility: ICT supports remote work, online learning, and virtual meetings. Innovation: integration of ICT drives creativity and new solutions in various fields, like how small kids are using Copilot for drawing purposes. So, this is the advancement or advantage of ICT. Enhanced productivity: automated systems increase efficiency and accuracy in tasks.

But there are limitations of ICT also. Everything has its limitations, its challenges. ICT, the basics of ICT, also have them. While it has numerous benefits, it also has certain

limitations. What are these? The digital divide, of course, Privacy concerns, definitely, this is the biggest issue. The widespread use of ICT raises concerns about data security and user privacy.

Technical issues: dependence on technology makes users vulnerable to system failures or cyberattacks. So, we try to use ICT, but we should not be dependent. I always tell in my classes to be the master of technology, not the slave of technology. So, high initial cost is also a limitation of ICT, like gadgets different gadgets we want to use, such as tablets or laptops may cost high, and the skill gap. This is the biggest gap because digital literacy, the training required to utilize ICT is lacking in this area. Now, we can conclude that, finally, ICT plays an essential role in education.

Supporting classroom teaching, distance learning, and online education, it enables the creation of virtual classrooms and serves as a powerful tool in formal, informal, and non-formal education. Additionally, it acts as a reliable source for professional, dedicated students. to the welfare and development of children and students, showcasing their versatility and values across multiple sectors. The basics of ICT form the foundation for modern communication and information management. Its continued development promises to transform various aspects of life, fostering innovation and global connectivity while addressing challenges like the digital divide and data security. These are the references for your further studies.

Thank you.