

EDUCATIONAL TECHNOLOGY AND ICT

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Week-01

Lecture-02

Module-2: Nature and Evolution of ET

Hello dear learners, welcome to SWAYAM-NPTEL course on Educational Technology and ICT. I am Dr. Sarita Anand from Department of Education, Vinaya Bhavana, Visva-Bharati, Santiniketan, West Bengal, India and the course coordinator for this course.

Today, I am going to present the module 2 on Nature and the Evolution of Educational Technology. In previous lecture, we have covered the introduction, definitions and the key components, need and applications of educational technology. And today we will talk about the nature and the evolution of educational technology and ICT. First, we will talk about nature of the educational technology.

The nature of educational technology is multifaceted, reflecting its role as both a practical tool and a theoretical field within education, it encompasses a range of digital and non-digital tools, methods and practices aimed at enhancing the learning process. Educational technology is characterized by its dynamic and evolving nature, with each new advancement opening up possibilities for improving teaching and learning outcomes. following are some key aspects that define the nature of educational technology.

The first one is interdisciplinary field. Educational technology draws from multiple disciplines including education, psychology, computer science, information technology and engineering.

This interdisciplinary foundation allows it to address various aspects of learning from cognitive development to digital skill building and ensures that it remains adaptable to educational needs of the learners. Research in fields like cognitive science and infrastructural design informs the development of effective educational technology tools while advances in IT enables the creation of platforms, software and digital resources.

Systematic and structured approach this is the second nature of the educational technology which follows a systematic approach to design implement and evaluate teaching and learning tools and strategies this approach often involves instructional design models such as eddy model analysis design development and implementation and evolution which structures the process of developing educational programs or resources. This systematic methodology ensures that tools and strategies are purposefully developed, tested and refined for maximum effectiveness.

The third one is learner centric approach. We know this approach is very essential for the students. At its core, educational technology aims to support and improve student learning outcomes. It focuses on the meeting the individual needs, interest and learning style of students, fostering a personalized and adaptive learning experience.

Adaptive learning platforms, for instance, use data to adjust the content and difficulty to each learner's progress. While gamified applications make learning engaging and motivational. Many schools are using this gamified type of learning experiences using the apps like Kahoot! This learner-centric approach promotes autonomy, motivation and active engagement.

The fourth one is dynamic and ever-evolving. This is the basic nature of educational technology. It is inherently dynamic, evolving in response to advances in technology, changes in educational theories, and societal needs. New developments such as artificial intelligence, virtual reality, and augmented reality continue to expand the possibilities within the field. This adaptability makes educational technology an ongoing field of research and development, with constant innovation finding new ways to engage learners and support educators. It means whatever is written in books about educational technology may change every five years or a decade.

The fifth one is interactive and collaborative. Educational technology promotes interactivity and collaboration, which are essential for effective learning. Through digital platforms, students can engage in interactive activities such as simulations, quizzes, and games that reinforce learning through hands-on experiences. Collaborative tools such as Google Workspace or Microsoft Teams enable group work, discussions, and project-based learning. They connect students and teachers regardless of their geographical location, fostering a sense of community and teamwork and we already have this experience during the COVID-19 period.

Enhancement of traditional teaching methods: Rather than replacing traditional teaching, educational technology complements and enhances it. It is not going to replace the teacher's place in the education system. For example, blended learning combines face-to-face instruction with digital resources, allowing students to engage with the materials in various ways.

Tools like interactive whiteboards, online quizzes, and multimedia presentations can make traditional classrooms more engaging and facilitate a better understanding of complex concepts. The seventh one is accessibility and inclusivity. Educational technology aims to make learning accessible to all, regardless of geographical, socio-economic, and physical barriers. Digital resources and platforms provide equal learning opportunities, offering a level playing field for students from diverse backgrounds. Tools like screen readers, subtitles, and text-to-speech software enable students with disabilities to access content, and mobile learning helps students learn even in remote or underserved areas.

These days, special students utilize different podcasts and audio aids for the accessibility of educational content. Practical application and real-world relevance. Educational technology often emphasizes the real-world application of knowledge, bridging the gap between theory and practice. Tools such as virtual labs, coding platforms, and simulations allow students to apply theoretical knowledge in practical settings. They help them develop problem-solving skills relevant to real-life situations.

These days, small children are learning coding and developing different apps, helping society in various ways. Moreover, by familiarizing students with digital tools and online platforms, educational technology prepares them for future careers and the digital demands of the workplace. The next one is problem-solving oriented. One of the essential goals of educational technology is to address and solve problems in education. Whether they are related to accessibility, engagement, or efficiency.

Educational technology seeks innovative solutions for issues such as large class sizes, limited resources, lack of personalization, and student disengagement. For example, ET can address overcrowding in classrooms by offering online resources, as NIOS is doing. Thus, allowing students to learn independently and outside of class hours will solve the problem of overcrowded classrooms. The next one is cost-effectiveness and efficiency. While implementing educational technology solutions may require initial investment, many educational technologies are cost-effective in the long term, especially in areas like e-learning and remote education.

They reduce dependency on physical materials, transportation, and facilities, offering scalable solutions for a large number of students. Digital assessment and online grading systems also enhance administrative efficiency, freeing up teachers' time for instruction and feedback rather than paperwork. It means it is cost-effective not only in terms of cost and money but also in saving time. The next one is ethical and responsible use. The nature of educational technology includes a strong focus on ethical practices and responsible use, particularly concerning data privacy, digital citizenship, and equitable access.

Students, parents, and educators are increasingly concerned with how student data is used, stored, and shared. Promoting responsible digital behavior, online safety, and ethical use of information are integral components of educational technology. Ensuring that its application aligns with societal values and the welfare of students. Recently in *Mann ki Baat*, the Prime Minister also announced that there is no concept of digital arrest. So, we have to be aware of the different ethical practices of educational technology.

The last one is global reach and scalability. Educational Technology enables global reach, allowing students to access quality education regardless of geographical location. Massive open online courses, for example, offer world-class instruction from prestigious universities to students across the globe. The scalable nature of educational technology also allows educational institutions to increase their capacity and accommodate more learners without significant infrastructure expansion.

Thus, the nature of educational technology refers to its role as an indispensable resource that enriches the teaching and learning experience. It is interdisciplinary, systematic, and learner-centered, emphasizing accessibility, personalization, and real-world relevance. Its dynamic, evidence-based approach means it evolves alongside advances in technology and pedagogical theory, ensuring that education remains relevant and effective in a rapidly changing world.

The commitment to ethical practices and inclusivity also helps create a more equitable educational landscape, making it accessible and adaptable for all. Now, we will talk about the origin and evolution of educational technology. As we have already discussed, the basic nature of educational technology is evolving day by day. New trends and new techniques are emerging, and educational technology is evolving itself. So, the evolution of educational technology traces back to early human history and spans several key developments across centuries while it began with simple tools and techniques to aid

teaching, It has now grown into a sophisticated, data-driven, and interactive field that transforms learning experiences through technology.

Educational technology consists of two elements. These are the key elements: education and technology. While both components have continuously evolved, the primary goal of educational technology is to identify and integrate the most effective and advanced tools-both hardware and software-that cater to the educational needs of learners and society in specific times and contexts.

It is well understood that the methods and tools employed to enhance educational processes and outcomes have consistently adapted to the evolving standards of excellence, shaped by societal advancements in science, philosophy, psychology, and technology. Consequently, there is a noticeable shift in the types and applications of technology used in education across different historical and cultural areas, reflecting the dynamic nature of human progress and civilization.

Following is a historical overview of how educational technology has evolved over time. Without discussing the evolution of this period-wise development of educational technology, we cannot work according to present needs. So, the first pre-industrial era: the foundation of teaching aids. Oral tradition and storytelling were the prominent methods of teaching.

In the early stages of human history, before the invention of writing, teaching and learning primarily relied on oral methods, where knowledge was passed from generation to generation through storytelling, songs, and spoken language. Teachers commonly used verbal presentations, while students engaged in recitation and memorization. This practice was widespread across the civilization.

For instance, the oral dialogue system between teachers and students advocated by Socrates in the West and the oral teaching tradition upheld by ancient sages in the Gurukuls of India exemplify the use of appropriate technology for education during that era of human civilization. Writing systems and basic tools. The introduction of writing, a medium of communication, marked a significant advancement in teaching and learning. Written languages became a powerful educational tool, making knowledge transferable and preserving it over time.

Early practices included writing on leaves and tree trunks, engraving on metals and rocks, and eventually using paper and ink. This evolution in writing technology revolutionized

education, paving the way for the development of printed materials and textbooks. These innovations provided a significant boost to teaching and learning processes, representing a major milestone in scientific and technological progress.

Blackboards and chalkboards in the 18th century, blackboards and chalk were introduced, providing a visual aid in classrooms. This tool enabled teachers to share written information with an entire group, making learning more interactive.

The second development was 19th-century print-based educational technology. Writing and printing technology further advanced the field of teaching and learning by facilitating the creation and use of tools such as chalkboards, pictures, charts, models, maps, diagrams, and other graphic materials.

Textbooks. The printing press, invented in the 15th century, led to the production of textbooks and other educational materials in the 19th century. These books became the primary source of information and a central part of the formal education system. Then came correspondence education. In the late 19th century, correspondence education emerged, allowing students to study through printed materials and postal services. This was an early form of distance learning, making education accessible to those who could not attend traditional schools. In the early stages of IGNOU, their functioning was also similar.

The course content was provided in printed materials, but now, due to evolution, IGNOU is working fully online. The third one is early 20th-century audiovisual technology. As industrial development and technological advancement progressed, education began utilizing scientific instruments, mass media, and educational materials. This led to the integration of sophisticated hardware and software, including radios, television, tape recorders, films, and transparencies, into the teaching and learning processes as below-

The film and radio: With the advent of film and radio in the early 20th century, audiovisual materials became educational tools. Educational films and radio programs were created to broadcast educational content to students. For example, the BBC began offering educational radio broadcasts in the 1920s.

Projectors and slides: Slide projectors and overhead projectors were introduced in classrooms, enabling teachers to display images, diagrams, and enriching the learning experiences with visual aids. In our graduation time, we also used overhead projectors, and now we are using LCD projectors.

The next one is behaviorism and programmed instruction. Behaviorist theorists, particularly B.F. Skinner's work led to programmed instructions in the 1950s. This approach used step-by-step learning sequences, often with teaching machines, to reinforce teaching and learning through immediate feedback. Actually, the teaching machine was given by Sidney L. Pressey, and his work was followed by Skinner, leading to the concept of programmed learning.

The next one is the mid-20th century when computers entered education. The introduction of programmed instruction and learning theories added a new dimension to the concept of educational technology. This understanding was further expanded with the development of innovative approaches such as the system approach, microteaching, interaction analysis, and computer-assisted instruction (CAI).

Computer-based learning in the 1960s Computers began to be used in education for the first time, mainly in universities and research institutes. PLATO (Programmed Logic for Automated Teaching Operations) was an early computer-based education system developed by the University of Illinois. It provided interactive learning modules, setting the stage for computer-assisted instruction.

Educational television: Educational television channels and programs become popular, providing educational content to the students. For instance, PBS, public broadcasting service in the US, began broadcasting educational programs for children, such as CSAM Street, which taught language and numeracy skill.

In 1970s to 80s, the rise of personal computers. Microcomputers in classroom with the advent of affordable personal computers in 1970s and 1980s schools started integrating computers into classroom. The Apple II, Commodore PET, IBM PC become popular for educational purposes allowing a student to interact with learning software. And what this is learning software? The educational software like Logo, a programming language for children and early math and reading games were developed, software applications expanded student's engagement and offered personalized learning through interactive programs.

Then introduction of LMS concept. The learning management system concept emerged during this period. Laying on the groundwork for the platform that manage the deliver educational content digitally. In 1990s the internet and digital revolution. Internet came and there was big revolution in the field of education and the internet-based learning

started. The rise of internet in 90s revolutionized educational technology by providing vast resources and online learning opportunities.

The internet allowed students and teachers to access information instantly and to connect with the global educational resources. Earlier we have to go to the library and pick the books and then refer to the students because the course content and resources were not available online. But this internet or digital revolution made a role of game changer. E-learning and online courses. Institutions began offering online courses. Expanding distance learning and making it more interactive. This marked the beginning of e-learning as a student could access course materials, take quizzes and interact with the teachers via emails or forums.

Multimedia Learning The integration of multimedia elements such as audio, video and the graphics became possible with the CD-ROMs and online resources. Multimedia made learning more engaging and supported different learning styles. Many publishers started giving CDs with the books for the children. They attached, pasted the CDs with the books. This was the multimedia learning. The web 2.0 and social media saw the rise of web 2.0 which enabled interactive and collaborative features like blogs, wikis and social media.

This allowed students and educators to create, share and discuss content making learning more participatory. Learning management system, the platform like Blackboard, Moodle, Canvas, Google Classroom emerged allowing students to organize and manage online courses. LMS become a key component in educational institutions for managing courses assignments and communication.

Mobile learning. With the introduction of smartphones and tablets, mobile learning, which we call M-learning, became popular, allowing students to learn anywhere, anytime. Educational apps, e-books, and mobile-friendly websites made learning more flexible and accessible. Like, if you want to Access the NCERT books, you just need to go to the website of NCERT, and whatever class book you require or the subject book you need, you can fetch it from the NCERT's website.

Next one is 2010: Advanced Technologies and Personalized Learning. Here comes cloud computing and digital content. Cloud computing enabled the storage and access of educational content online, making it easier for students and teachers to access resources from any location. Google Classroom and Office 365 for Education became popular for collaborative work and resource sharing.

MOOCs (Massive Open Online Course) platforms like Coursera, edX, and Udacity offered MOOCs, making high-quality education accessible to a global audience. These courses often provided certificates and opened up opportunities for people around the world to learn from top universities. Similar efforts were made by our government in later stages. Gamification and game-based learning: Educational games and gamified learning experiences such as Kahoot and Duolingo became popular as they motivated students to learn through interactive challenges and rewards and the next one is the 2020s.

Artificial intelligence, virtual reality, and beyond. In the 2020s, artificial intelligence-driven educational tools provide personalized learning experiences and automate administrative tasks. Intelligent tutoring systems and virtual teaching assistants, such as chatbots, can adapt to individual learning styles, assess progress, and offer personalized support.

Virtual Reality and Augmented Reality (VR and AR) create immersive learning experiences, enabling students to explore simulated environments, conduct virtual experiments, and visualize abstract concepts. These technologies are particularly effective in subjects like history, science, medicine, and geography. Remote and hybrid learning modes.

The COVID-19 pandemic accelerated the adoption of remote learning technologies. It shifted education online. Hybrid models combining online and face-to-face learning became widespread. Platforms like Zoom, Microsoft Teams, and Google Meet facilitated virtual classrooms.

In conclusion, the evolution of educational technology has been marked by continuous innovation, with each stage building upon previous advancements. It has grown from basic teaching aids to complex systems that leverage Artificial Intelligence, data analytics, and immersive technologies like these days, the Government of India is using the PM eVidya platform; where an augmented reality app was developed by CIET.

Today, Educational Technology offers personalized learning experiences, access to global resources, and real-time feedback, transforming the education landscape and making learning more inclusive, accessible, and interactive. As technology continues to evolve, so too will educational methods, creating new opportunities for educators and learners alike to make meaningful and effective learning.

Thank you.

