EDUCATIONAL TECHNOLOGY AND ICT

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Week-03

Lecture-12

Module-12: System approach and its components

Hello dear learners, welcome to the SWAYAM-NPTEL course on Educational Technology and ICT. I am the course coordinator, Dr. Sarita Anand, from the Department of Education, Vinaya Bhavana, Visva-Bharati, Santiniketan, West Bengal. Today, we will talk about the systems approach and its components, Module 12, and Lecture Number 12. The concepts covered in the previous lecture were the scope of educational technology, the importance of educational technology, the use of educational technology in teacher education, the Indian context, the significance of educational technology in teacher education, and the challenges faced by the entire education system. Now, approaches to educational technology.

Educational Technology includes approaches to improve teaching and learning. The previous discussions helped us conclude that educational technology is a multifaceted concept. This has led to viewing it in terms of some specific types of approaches. Each of these focuses on different aspects of integrating technology into education, from physical devices to instructional content and organized frameworks. Accordingly, Lunzen in 1964 listed three different approaches to educational technology.

The first one is educational technology, or the hardware approach. The second one is educational technology, or the software approach, and the third is educational technology, or the systems approach. Let us discuss these types of approaches. The first one is the hardware approach. The hardware approach in educational technology involves the use of physical equipment or devices to facilitate instruction.

This includes individually used audio-visual aids and technological tools that support or enhance the teaching-learning process. The main components of the hardware approach include projection devices like overhead projectors, LCD projectors, and interactive whiteboards, which help display visual aids, presentations, and multimedia content to

engage students. Computers and tablets are essential tools that allow students to access digital content. They also enable students to participate in interactive learning activities and collaborate on projects. Smart classrooms

Equipped with hardware like interactive whiteboards, digital podiums, and virtual reality headsets, these classrooms create immersive learning experiences. Multimedia tools like cameras, microphones, and audio systems support audiovisual learning, enabling students to hear and see instructional materials clearly. What are the advantages of these? They enhance engagement. Hardware devices like interactive whiteboards and projectors make lessons visually appealing and interactive.

Immediate-access devices such as tablets allow instant access to digital resources, saving time and improving learning efficiency. Interactivity and collaboration: Hardware and smart classrooms allow students to collaborate, access real-time feedback, and participate in interactive activities, but there are also limitations. Cost. The hardware approach often requires substantial investment, particularly in developing regions or underfunded schools.

Maintenance. Hardware devices require regular maintenance and update which may be costly and intensive. Maintainance. Hardware devices require regular maintenance and updates which may be costly and time intensive. Over reliance on the hardware can lead to challenges if device is malfunctioning or need repair.

Software Approach The second approach is software approach involves the use of educational content, programs and digital tools to facilitate learning unlike hardware. Which is tangible software referring to the application and instructional content delivered via digital platforms. Like main component of these software approach includes the learning management system. Platforms like Moodle, Canvas, Google Classroom help instruction, manage courses, distribute content and access student progress.

Educational apps and programs. These include simulation, software, educational games and subject-specific like GeoGebra or mathematics or language learning apps like Duolingo. E-books and digital content, digital textbooks, video and reading materials are used to support instruction and provide students with rich multimedia content. Assessment software tools like Kahoot and the Quizlet allow for interactive and formative assessment providing real-time feedback to both students and the instructors.

The advantage: The personalized learning software programs can adapt to individual student needs, allowing for differentiated instruction. Scalability: Digital content can be

easily shared with a large group of students without the logistical limitations associated with physical materials. Enhanced accessibility: Software can be accessed remotely, allowing students to learn outside traditional classroom settings. Every concept has its own limitations.

Access and equity: Not all students may have access to the internet or personal devices, creating a digital divide, which we have already faced during COVID-19, where many students lacked digital devices. Teacher training. Effective use of educational software requires teacher training. If teachers face a learning curve in mastering new tools, they will not facilitate these digital devices' features to their students. Screen dependency: Excessive reliance on digital content can increase screen time, which may have negative effects on health, especially the eyes.

The third one is the system approach. The system approach in educational technology is a holistic and organized way to design, implement, and evaluate instructional programs. It views education as an integrated system in which each component, such as objectives, materials, methods, and assessment, works cohesively to achieve learning goals. It works in steps. The major steps involve-

the first one, goal setting: Defining clear objectives and learning outcomes that guide the instructional design process. Input and resources, identifying the necessary resources such as teacher, content, technology tool and understanding the student need is important. Instructional strategies. Selecting and implementing appropriate teaching methods and materials to achieve desired goals and outcome is important. Feedback mechanism, establishing ongoing feedback loops to monitor the progress of the students and identify the area of the improvement is required.

Evaluation. conducting formative and summative evaluation to access the effectiveness of the instructional system and make necessary arrangements by the teachers. Models in the system approach. We always mostly we use Eddy model and Dick and Corey model. These two models are very famous.

The first one is the widely used model involves the stages of analyzing, design, development, implementation and evaluation ensuring each instructional steps align with the learning goals and the second one is the Dick and Corey model. This model emphasizes the interdependence of all instructional design components from goals to assessment ensuring structured process of course design. There are the advantages, the holistic view,

the system approach considers all aspect of instruction ensuring that every part supports to the educational goal, continuous improvement

Feedback and evaluation are integral, allowing educators to refine their improvement with their methods of the teaching. Consistency provides a structured framework that aligns with organizational goals, promoting consistency in instructional quality. We know that the systems approach involves hardware and software, and these two terms are intertwined with each other. One is incomplete without the other. So, there are some limitations.

The rigidity: The structured nature of the systems approach may limit flexibility, making it challenging to adapt to spontaneous changes. Time-intensive. Implementing a systems approach requires careful planning and coordination, which may be time-consuming.

Now, a comparison of hardware, software, and the systems approach: Here, I have provided a table to compare the three concepts: hardware, software, and the systems approach, focusing on main components, advantages, and limitations, which we have already discussed. This will help you conduct a comparative study of these three approaches.

Overview of the systems approach and its components. The systems approach is an organized way to tackle complex problems or tasks by viewing them as an integrated whole rather than isolated parts. It means we are not handling only software or only hardware, but together we are using them as a system.

Originating in fields such as engineering, management, and computer science, it is widely used in education to design, implement, and evaluate instructional programs or interventions in a structured manner. When applied in education, a system approach helps educators and administrators think holistically about the process, ensuring that each component be it instructional methods, materials, learners or assessment works together effectively to meet the educational goals. The system approach is based on the idea that educational processes are best understood as interdependent parts of a whole system each component contributing to the achievement of overreaching learning goals this holistic perspective allow educators to analyze design implement and evaluate learning systematically focusing on efficiency consistency and continuous improvement.

The major components of the system approach in education are: The first one is goal setting. In other fields also we go for the goal settings and here also it means in each and every task first we have to decide the objective and here in education every system has

defined purpose or objective. In education too this might involve achieving certain learning outcomes or ensuring that students acquire specific skills. Defining clear goal is essential to guide the design and operation of the system so that first step in the system approach is to define clear and measurable objectives.

These guide all further steps and serve as a benchmark to measure success. These objectives can cognitive, knowledge based, affective, attitudinal or psychomotor skill-based, each with specific desired outcomes. We do these things in our lesson planning when B.Ed. or M.Ed. students go for teaching, they make their instructional objectives on the basis of knowledge, affective and psychomotor domains keeping in their mind.

Goals and objectives ensure that all instructional elements are aligned, helping both instructors and the learners with staying focused on their objective. The second one is input analysis. Input are the resources and elements necessary for the instructional process including learner. Understanding the background, need and the learning style of a student help in tailoring the content and methods by the instructor. Content, the subject matter or the material will be taught, which should be structured to meet the defined objective, which already decided.

The instructors, their role, expertise and the teaching styles play a critical part in the system's effectiveness. Materials and the resources, these includes textbooks, digital tools, visual aids and other resources that facilitate learning. These days we provide the material in the form of PDFs and the PPTs etc. The environmental factors, external factors such as classroom setups, institutional resources, even socio-cultural influence which can affect the learning experience.

The next one is the process: The process is instructional strategies and the method in education. instructional design. This involves the planning how learning will occur often using a structured framework like eddy model or the Deccan-Corey model we have already discussed. We will also discuss it in later stages.

Teaching methods: Selected based on the objectives and the learner's needs, methods may vary from the lectures and the discussions to the problem solving, simulation and hands-on activities as per the teacher's teaching styles and the content knowledge. Learning activities. These are specific tasks and exercises designed to engage students and reinforce learning such as group work, project or online modules or any kind of assessment or assignments or the project given by the teacher to the learners.

Sequence and structure: Instruction is organized into logical steps or phases moving from introductory concepts to complex applications ensuring a scaffolded approach to learning. Here in this course also we are trying to go by the simpler things to tougher things. So, the whole course is also decided in the different phases.

The next point is output the learning outcome here in education we call it learning outcome. Expected outcome these are the in result of aligned with the initial goals such as knowledge skill mastery and behavioral changes.

Assessment and evaluation: Learning outcomes are assessed to determine if the objectives were met. This includes the formative assessment and summative assessment. Formative assessment conducted during the instructional process, it allows real time improvements, ongoing checks of the understanding like quizzes or classroom discussion or questioning in the class and the summative assessment conducted at the end of the instructional period, it assesses the overall success in achieving objectives.

The comprehensive evaluation such as final exams or project submissions which measure the overall learning at the end of the course or the module or the online course which you are pursuing the final examination the proctored examination conducted by NTA will be your summative assessment. The type of outputs. Output can be quantitative like test scores, completion rates or the qualitative like improved attitude, behavioral changes in teacher trainees depending on the objective of the course. The feedback mechanism, the role of the feedback, feedback health, monitoring, progress and making, adjustment.

It is an ongoing process throughout the instructional cycle. The students' feedback towards the teacher, their teaching play's important role in this mechanism. The source of the feedback, the learner's feedback, information on the students' understanding, challenges and engagement helps instructors refine their teaching strategies. If students are taking interest, then we can continue our teaching style.

If students are not taking interest, they are giving the negative feedback, then we can change our teaching strategies. Instructor feedback, observation and reflection on what work well and what did not are essential for continuous improvement for both the learners and the instructor. Adjustment and refinement based on the feedback components of the system like content delivery and assessment methods may be modified to better meet learning objectives. Now the advantages of the system approach in education. The first advantage is structured process.

We have already discussed that it facilitates organized planning and execution of instructional activities, reducing trial and error. The second one is the alignment of components. It ensures that each part, from resources to evaluations, contributes toward achieving the learning goals. Focus on outcomes. It keeps the educational process goal-oriented and improves the likelihood of success.

The next point is continuous improvement. The feedback loop provides a basis for ongoing refinement, enhancing both teaching and learning experiences. Adjustment and refinement. Based on the feedback, components of the system, like content delivery or assessment methods, may be modified to better meet learning objectives. For example, applying the system approach to a teacher training program: if we want to understand the system approach in a teacher training program, we will take one example.

Imagine an instructor designing a teacher training module on integrating technology in the classroom. What will be the goal? Equip future teachers with the knowledge and skills to effectively incorporate technology into their lesson plans. What will be the input? The learners: pre-service teachers with varying technological skills.

The content topics like digital tools, instructional software, classroom technology strategies will be the input. The resources, computers, software, licenses, training videos, the laptops, the projectors, each will be the input. Then the process, teaching methods, interactive workshops, hands-on technological practices, peer feedback sessions, the sequence starting with the basic technological skills progressive to the complex tech integration strategies will be the process. The outcome, what will be the outcome?

Teachers demonstrate technological competency by creating sample lesson plans and incorporating technology effectively. The feedback, ongoing assessment and reflective reflections help trainers address challenges like lack of confidence or skill gaps in this process. The evaluation, the final project assessment to determine if the teacher can integrate technology effectively with the summative feedback provided for improvement or not. This approach ensures each aspect of training as well as integrated and contributes to achieving the program's overreaching goals.

In conclusion, we can say that the system approach to educational technology represents a comprehensive structured method for addressing complex educational challenges. By emphasizing the interconnectivity of various components including objectives, resources, instructional strategies, and evaluation methods, this approach ensures that all aspects of learning process work harmoniously to achieve desired outcomes. Unlikely fragmented or

ad hoc methods, the systems approach provides A logical framework that aligns with the dynamic needs of learners and educators in diverse contexts. Educational technology when guided by the systems approach becomes a powerful tool for enhancing the teaching learning experiences.

Furthermore, it accommodates flexibility and scalability, allowing the educational program to adapt to changing goals, environments, and learner needs. Ultimately, the systems approach underscores the importance of planning, collaboration, and continuous evaluation in the design and implementation of educational technologies. These are a few references for your further studies, you can go through them.

Thank you.