UNIT 11 ICT IN LEARNING

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11.0 INTRODUCTION

As a teacher you have experience in teaching different concepts in various school subjects using different types of teaching learning methods and materials for making learning more interesting and effective in the classroom. However, in many cases you may have faced difficulties in accessing information from different sources and provide more opportunities for students' participation in the classroom. In this respect Information and Communication Technologies (ICTs) has opened up the possibilities to access a range of information for both teachers and students which was unthinkable a decade back. Besides, it is now felt that ICT can assist in promoting more learner-centred and interactive learning. As a teacher you have to develop the skill of integration of ICT in the classroom. In this unit, let us learn the meaning of ICT, different ICT tools, ways of integration of ICT in classroom transaction and in the assessment process.

You will need at least 7 hours of study for completing this unit and understanding theconcepts included in it.

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11.1 LEARNING OBJECTIVES

After completing this unit, you will be able to:

- explain the meaning of Information and Communication Technology (ICT).
- identify and use the different tools of ICT.
- integrate ICT tools in classroom activities.

11.2 INFORMATION COMMUNICATION TECHNOLOGY (ICT)

Information and Communication Technology(ICT) is defined as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information (UNDP, 2000; UNESCO 2002). This definition of ICT includes such technologies as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, computer and network hardware and software as well as the equipment and services associated with these technologies, such as video conferencing and electronic mail. ICTs comprises of the following three components:

i. *Information and Communication Infrastructure (ICI)* which includes physical telecommunications systems, networks (cellular, broadcast, cable, satellite, postal) and the services that utilize those (Internet, voice, mail, radio, and television);

ii. *Information Technology (IT)* that refers to the hardware and software of information collection, storage, processing, and presentation (World Bank 2002); and

iii. *Communication Technology (CT)* like telephones, e-mail, chatting, etc.which helps to disseminate information and facilitate interaction among students and teachers irrespective of the distance, time and situations.

Therefore, ICT can be understood as integration of information technology with different kinds of communication technology with the help of appropriate infrastructure. It can be said that there is major role of information technology in enhancement of communication. Given below are examples of such technologies are:

- Print based materials,
- Photography, pictorials, graphics,
- Audio communication systems including audio broadcast,

- Telecommunication,
- Satellite communication,
- Computer based technologies likethe Internet and E-mail,
- Wireless communication,
- Mobile technology.

11.3 TOOLS OF ICT

The tools ICT may be in the form of audio, visual and audio-visual. There is a diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information. The tools of ICT have great potential to facilitate the acquisition of knowledge and developing proper understanding by the students in the classroom. Just think about how you collect the information from different sources?

Generally you collect information from different sources available to you like textbooks, magazines, reference books, journals, class notes and other non-print sources. But to make the collected information presentable in the classroom, you require more time and resources which are not always available to you. Hence, very often you feel your lesson is not comprehensive. Again the students often cannot have direct access to the information that you can have. But, the tools of ICT reduced such gaps and made not only acquisition and absorption of knowledge by the students possible but also sharing/collaboration in the classroom. The tools of ICT also have the potential to create learning opportunities for all types of students including both physically and mentally challenged students.

The tools of ICT are not single technology but combination of hardware, software, multimedia, and delivery systems. Today, ICT in education encompasses a great range of rapidly evolving technologies such as Desktop, Notebook, Handheld Computers, Tablets, Digital Cameras, Local Area Networking, Bluetooth, the Internet, Cloud Computing, the World Wide Web, and DVDs and applications such as word processors, spreadsheets, tutorials, simulations, email, digital libraries, computer-mediated conferencing, videoconferencing, virtual environment, simulator, emulator etc. These tools of ICT can be used for creating learning situations in the classroom as well as in engaging the students in higher order thinking.

11.3.1 Classification of Tools

In the classroom you prepared and followed different instructional activities for the success of learning. In such learning process ICT can play different roles according to the nature of the content and the learning style of the students. The

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different available tools of ICT have different roles in the classroom. We can broadly classify the tools of ICT into four categories as follows:

i. informative tools,

ii. situating tools,

iii. constructive tools, and

iv. communicative tools.

These tools have different uses in different contexts. Let us discuss these tools in details.

i) ***Informative Tools:*** These tools of ICT provide huge information in various formats such as text, sound, graphics, or video. Examples of informative tools include multimedia encyclopaedias or resources available on the World Wide Web (www or Web). You can use the informative tools particularly for the purpose of collecting information. Although these tools cannot help to get the real life experiences, it presents abstract information. Suppose you are going to teach the concept of democracy in social science. You may assign the students to collect information on the governance system of different countries. Students can collect different information on governance with help of the informative tools of ICT like internet.

(ii) ***Situating Tools:*** There are some ICT tools like simulation, games, and virtual reality through which students can be placed in an environment where they may get "nearly direct experience" through observation or practice in an artificially created model of real situation. These tools particularly help to understand the abstract concepts. Suppose you are going to teach on the topic blood circulation system of human beings. Students will gain better experiences by the help of You Tubes, video clips, specially prepared DVDs etc. where they can observe the moving streams of blood in the arteries and veins and functioning of heart with details of the physiology of the blood circulation.

(iii) ***Constructive Tools:*** There are different tools of ICT that you can use for constructing, manipulating as well as visualizing your own knowledge. For example, the tools of ICT like web authoring applications which allow creating one's own web pages and communicating ideas to others around the world.Here your constructive ideas/information reaches throughout the world including peers and teachers. In the same time you can also get the feedback about your ideas from the learner community. Other examples of such constructive tools of ICT are Mind tools, which includes computer applications such as databases, spreadsheets, semantic networking programs, expert systems, modelling tools, micro worlds, and hypermedia authoring tools that enable students to represent and to generate the knowledge.The term "constructive" originate from the fact that these tools of ICT enable to produce a certain tangible product for a given instructional purpose.

(iv) ***Communicative tools:*** We communicate our ideas/ knowledge/views with the help of communicative tools. But many of them are time-consuming. Take the example of the postal system which takes more time for your informationto reach. Although the telephonic device reduced the time but its limitation is between two people. However today we can communicate with a large group of people within a few seconds by using ICT tools. Examples of such communicative tools include e-mail, electronic bulletin boards, chat, teleconferencing, and electronic whiteboards. Such communicative tools of ICT are called web-2.0. One of the important characteristics of such tools is simultaneous conversation among the group of people in the form of text, picture or sound. These tools are the systems that can enable communication between the teacher and students or among students beyond the physical barrier (due to space, time, or both) of the classroom.

11.3.2 Use of ICT Tools

Information Communication Technology (ICT) have enabled changes in the lives of people, their world of work, and helped them to interact with several persons and sources around the world. It opened up new ways to acquire knowledge. The use of ICT tools not only conforms with in the sector of education but also it has major use in different sectors like finance, industry, insurance, medical and management also. Today the tools of ICT are vital in the classroom for creating the learning situation. These not only help the student for collecting information from different sources but also give an opportunity for disseminating the information among the peers. The impact of use of ICT on students is highly dependent on the teaching approaches and better outcome result when student-centred guidance, group work and inquiry projects are used. Let us discuss different use of ICT tools in the teaching learning process.

- ***In Pedagogies:*** As a tool, ICT can provide the supportive or facilitative approaches in the classroom. By using tools of ICT, particularly the situating and communicative tools, you can guide the students learning and at the same time students also get the supportive service from the ICTs. Besides, you can also use the tools of ICT in different phases of pedagogical process i.e. during the introduction, presentation as well as in the assessment phase. In the classroom during your instructional process, the tools of ICT will motivate the students and encourage interaction among the peers. However, the ICTs by themselves will not improve pedagogy. Teachers who shift their pedagogies to be more student-centred, project-based and collaborative learning based teaching, ICT will support and assist. In a conventional education system, ICT may be used to support teacher-centred pedagogical approaches or in the combination of the two approaches. The aim is to make sound choices about what is best in different circumstances, selecting and using appropriate ICT tools for improving pedagogy. In other words,

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ICT can play a major role in promoting pedagogy for the facilitation of effective and efficient learning.

The roles of ICTs in the different types of pedagogies/ classroom processes and how different tools of ICT can help such pedagogy is illustrated in the following Table 11.1.

Table 11.1

Teaching Style	Main Characteristics	Use of ICT Tools
Teacher-centred approach	• Teacher as the source of knowledge. • Teacher tends to be more active and students receive the information passively	A wide range of ICT tools can be used to aid the teacher's presentation and performance. Hand-outs, overhead projector(OHP) slides, models etc. can be used to capture and retain the learner's attention
Learner-centred approach	• Learner as knowledge seeker, with teacher as facilitator and guide. • The learner tends to be active, talking and doing things in the process of learning. • The teacher designs and manages the setting as well as the process of learning.	ICT can be used extensively to help the learner make the sense of the tasks assigned and learn what is required. Work sheets, informative and communicative tools of ICT need to be available to the learners on an individual basis or in small group.
Combination of the two approaches	• In some cases, the teacher dispenses knowledge and the learner has to take things on trust. At other times, the teacher simply creates the conditions for the learner to explore and discover knowledge.	ICT can be used to aid the teacher's presentation as well as to assist learners in their exploration

(Source: Wright, C. (2000). Issues in Education and Technology: Policy Guidelines and Strategies, London: Commonwealth Secretariat)

- ***In collaboration:*** In learning centred approach of teaching, sharing/ interaction among the students and between the student and teacher is an important component. There are some tools of ICT that can be used for the purpose of collaboration inside and outside the classroom. You can share your views/ideas/knowledge with your students by using such tools and in the same time your students also share their ideas, suggest different views, and also clarify their doubts. These tools of ICT particularly used for the purpose of sharing are called as Social Communicating Tools. Examples of such social net working tools are wiki, yahoo group, Google group, blog, Facebook, twitter, my space etc.

- ***In Assessment:*** There are different tools of ICT available today that can be used to assess your students' performance during your teaching-learning process as well as after completion of the course. These tools enable both the process based assessment as well as the product based assessment. Suppose you want to assess the students' best work in your subject throughout the year. You can take the help of one of the tools of ICT called e-portfolio, through which you can easily and quickly assess your students' performance. Similarly other tools of ICT that can be used for assessment are online-rubric, online- peer assessment and digital concept mapping, etc. The advantages of using ICT tools in the assessment process are time management and it encourages reflection among the students.

- ***In the context of learning process:*** ICT enables your classroom by encompassing a variety of techniques, tools, content and resources. Ranging from projecting media to support a lesson, multimedia self-learning modules, simulations to virtual learning environments, there are a variety of options available to you for utilizing various modes/ICT tools in the learning process. Each of these device or strategy involves changes in the classroom environment and understanding of its effectiveness. ICT does play a significant role in different forms of teaching learning process viz., individual learning and teaching, group learning and teaching, collaborative learning activities, etc.

  - *Individual learning*

    Searching alternative sources of learning, reading a text, making queries and communication directly with experts, solving problems, taking assignments, assessing own progress, and getting feedbacks are some of the activities in individualized learning. Networking of computer and use of internet promotes such activities in individual learning. In such an approach of learning students completely take the help of ICT and then as a teacher your task is to monitor their learning and to regulate the learning process. This approach of learning is often called as Self-Regulatory Learning (SRL) in which ICT plays a vital role to make the learner as a self- regulatory learner.

  - *Group learning and teaching*

    Suppose in your class, you like to teach through group work strategy. In this strategy you can take the help of different tools of ICT that are suitable for group learning. For example, a particular group of students can have access to online lecture and facilities for interaction with the presenter as well as with other members in the same group. Today various kinds of course based teaching materials are available on World Wide Web (WWW) which makes it possible for fast delivery of course materials as well as problem solving activities. In your group learning

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strategy students can access such material from the web and undergo group interactions

- ***Collaborative learning :***Collaborative learning is commonly illustrated when groups of students work together to search for understanding, meaning, or solutions or to create an art fact or product of their learning. It is a situation in which two or more students learn or attempt to learn something together. Unlike individual learning, students engaged in collaborative learning capitalize on one another's resources and skills (asking one another for information, evaluating one another's ideas, monitoring one another's work, etc.). Put differently, collaborative learning refers to methodologies and environments in which students engage in a common task where each individual depends on and is accountable to each other. These include both face-to-face conversations and computer discussions (online forums, chat rooms, etc.).

E2. What are the different tools of ICT, which can be used in the learner-centre approach pedagogy?

E3. What are the different forms of ICT tools?

11.4 INTEGRATION OF ICT

Integrating ICT in the classroom is a challenging task for any teacher today. Operational knowledge of ICT alone cannot help you to use ICT in the classroom. You must have the fundamental ideas about the systematic ways (how and when) to integrate ICT in the classroom.

ICT integration is broadly defined as a process of using any ICT tools (including information resources on the web, multimedia programs in CD-ROMs) to enhance student learning. It is more of a process rather than a product. A simple placement of hardware and/or software will not make integration of ICT in the classroom. In order to integrate ICT in your classroom, you and your students will have to proceed in four different stages.

At the ***first stage***, teachers and students need to discover ICT tools and their general functions and uses. Hence the emphasis is usually on ICT literacy and basic skills. Discovering ICT tools is linked with the *emerging stage* in ICT development.

The ***second stage*** involves learning how to use ICT tools, and beginning to make use of them in different disciplines. This involves the use of general as well as particular applications of ICT, and it is linked with the *applying stage* in the ICT development model.

At the ***third stage***, there is an understanding of how and when to use ICT tools to achieve a particular purpose, such as in completing a given project. This stage implies the ability to recognize situations where ICT will be helpful, choosing the most appropriate tools for a particular task, and using these tools in combination to solve real problems. This is linked with the *infusing stage* in the ICT development model.

The ***fourth stage*** is when the learning situation is transformed through the use of ICT. This is a new way of approaching teaching and learning situations with specialized ICT tools, and it is linked with the *transforming stage* in the ICT development model.

11.4.1 Integration of ICT in the Learning Process

There are different models available for integrating ICT in the classroom. Many instructional design models are available to help you to integrate ICT in the classroom. Some examples are:

- The ASSURE model.

  (**A**nalyze learners; **S**tate the objective; **S**elect method, media and materials;**R**equire learning participation; **E**valuate and revise)

- The ICARE model.

  (**I**ntroduction; **C**onnect; **A**ctivity; **R**eflect and **E**xtend)

These models show guidelines for incorporating various resources and tools into teaching and learning. However, they do not explicitly encourage teacher-designers to think and justify why these resources and tools are used the way they are. Let us consider ***a systematic model*** for designing ICT integration plan. It is systematic because it follows a logical flow and organized in a linear manner. The key components of this model are as given below:

1. ***Problem Statement***: The systematic model starts with a problem statement, which describes the major problems or issues to be addressed in a topic. For example, in the topic of "Energy," the major problem is *"How energy can be conserved in India in the future?"* Such a problem statement serves as a starting point for the ICT integration plan. There are different concepts/ ideas in a topic during the teaching-learning process. There are concepts from which the learner does not get the real experience, or can visualize properly. You have to identify such concepts as the problems and plan to select such ICT tools that can solve such problem. The problem should be authentic, and challenging and relevant to the learners.
2. ***Learning Objectives***: Learning objectives specify the intended learning outcomes at the end of the topic. You may write learning objectives based on the ABCD model, where A is Audience; B is Behaviour; C is Condition;

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and D is Degree. For example, a complete description of a learning objective following the ABCD model might be:

At the end of the topic, the elementary students will be able to verbally describe the present energy situation in India and the ways to conserve it on a mind map with 100% accuracy.

In this example, A is "the elementary students"; B is "verbally describe"; C is "on a mind map"; and D is "with 100% accuracy." It is worth mentioning once again that the behaviour in a learning-objective statement should be observable and measurable.

3. ***Technology Required:*** In order to address the above stated problem and to achieve the learning objectives, you need to carefully compare all possible technologies that can be used for learning this topic. The technologies in this model may include software such as multimedia courseware, web-based resources, communication tools (such as voice chat, textual discussion forums, or video conferencing), mind tools (such as concept mapping tools and multimedia authoring tools), or any other possible ICT tools. You need to identify the tools of ICT to use in order to teach the topic 'energy' cited above in a meaningful manner.

4. ***Rationale for using the Technology:*** Technology should be used not because it is available or it has been shown effective in some cases. It should be used to enable the process and enhance learning as well as make clarity of the topic. Inappropriate use of technology can lead to negative effects. As a teacher you need to choose proper technology and justify

   i) why it is needed for the topic;

   ii) what added values the technology can offer; and

   iii) how the technology can support the instructional process.

   Moreover, other reasons for rationalizing the use of technology are:

   i) high motivation;

   ii) unique instructional capabilities such as helping students visualize data/ problems or tracking learning progress;

   iii) support for innovative instructional approaches such as collaborative learning and problem-based learning; and

   iv) increased teacher productivity and student knowledge construction.

5. ***Strategies for Implementation:*** After determining what technology is needed and why, you need to decide how to incorporate the selected technology into the learning of the topic effectively and meaningfully. Since a topic is usually composed of several lessons, details on ICT integration should be

provided separately for each lesson as well as for the entire topic. For each lesson, you need to clearly answer the following questions:

- What ICT-based resources such as web sites, CD-ROM programs, or learning objects will be used?
- How will the ICT-based resources be used in various settings such as a full-lab, where each student uses a computer, or half-lab environment, where two students share a computer?
- Why should these resources be used?
- What tasks/activities will the students do during the lesson?

6. ***Reflection and Further Suggestion:*** A plan is never good until it is executed and proven right. In the planning process, very often you are faced with many constraints and restrictions that limit your choices and strategies. After conducting the ICT integrated lessons, you need to reflect upon your experiences of the ICT integration. The reflections can focus on the appropriateness of the technology used, strengths and weaknesses of the technology, and possible improvement. Additionally, you can also provide further suggestions on how other teachers can use the lessons for different groups of students in different contexts. These suggestions may include alternative technology, instructional methods and activities, assessment approaches, and ways to improve the integration of ICT. Given below are some points to help a teacher reflect upon an integration plan:

   - Are the major questions involved in the topic answered?
   - Are the activities planned towards achieving the learning objectives?
   - Does the technology support the instructional process?
   - Is the rationale for using the technology sound?
   - Can the implementation process be further improved?
   - Are the methods for student assessment valid?
   - How can we further improve the use of ICT in the topic?

11.4.2 Integration of ICT in the Assessment Process

Recollect as to how you assess your students.

Usually at the end of the year, the students are assessed on how well they have mastered the intended concepts/competencies. The assessment approach mainly concentrates on the testing of basic knowledge, supposedly acquired through drill and practice, rehearsals and repetitions of what was taught in class or given in the textbook. Under such circumstances, tests, mainly of the choice-response format (such as multiple-choice, true/false or matching items), are the common tools for assessment. This assessment system is sometimes referred to as a *'testing*

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culture'. Now the assessment system has changed from testing culture to *reflective culture*. In the reflective culture of assessment, the primary emphasis is on self-assessment combined with peer-assessment. The purpose of such assessment is to assess students:

- Cognitive competencies such as problem solving, critical thinking, formulating questions, searching for relevant information, making informed judgments, efficient use of information, conducting observations, investigations, inventing and creating new things, analysing data, presenting data communicatively, oral and written expression;
- Meta-cognitive competencies such as self-reflection and self- evaluation
- Social competencies such as leading discussions and conversations, persuading, co-operating, working in groups etc. and affective dispositions such as perseverance, internal motivation, responsibility, self-efficacy, independence and flexibility.

These assessments often reflect both the process and the product. The assessment on the process examines how the students complete the learning activities or tasks, work together to complete the final product, or construct knowledge collaboratively by using the ICT. Methods used for the process assessment include writing online reflection journals, peer evaluation, or e-portfolios. The assessment on the product aims at investigating the quality of the final outcome, such as solutions to the problem, or software programs developed. Usually, there are two forms of assessment:

- *ICT-based assessment* which includes computer-based testing, multimedia program development, PowerPoint presentation, or concept map construction.
- *Non-ICT based assessment* which involves writing an essay or a reflection journal, or answering short questions on paper.

The integration of ICT in the process of assessment offers a set of possibilities, enhancing the implementation of an assessment culture. It enhances the integration of the following principles:

- *Flexibility:* Students can take part in formative as well as summative assessment at any time and at any place without any task restriction.
- *Assessment as a tool for learning:* The students have enough opportunity of learning while engaged in such assessment tasks or processes. Most test-serving systems offer profound feedback and students' progress is also available online due to which learning is enhanced.
- *Responsibility of students for their learning:*Flexibility is one condition for giving more responsibility to the learner. A second condition is sharing responsibility in the process of assessment. The use of electronic peer

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assessment and electronic portfolios are examples of electronic assessment methods that are in line with this principle.

- *Product and process assessment:* In most electronic portfolios as well as electronic peer-assessment systems, product and process assessment criteria are used.
- *A variety of assessment instruments:* ICT enhances the permanent availability of a set of different assessment instruments starting from measuring knowledge reproduction by standardized tests to the assessment of skills by electronic portfolios or peer-assessment systems.
- *Authenticity of assessment*: Real-life cases, electronic simulation games etc. are available online, which makes it feasible to assess different aspects of students' competencies in an authentic way.
- *The student as an active participant in the assessment process:* One aspect of this is the students' responsibility to develop the criteria for assessment through interaction and discussion with teachers. Electronic peer assessment is one example. A second aspect is the use of assessment tasks that ask students to actively construct a solution to the task. Examples are online, simulations and electronic case-based assessment instruments.

E4. What is integration of ICT in the classroom?

E5. What are the tools that can be used in the process of assessment?

E6. What are the advantages of ICT in the process of assessment?

11.5 LET US SUM UP

- Information and Communication Technology(ICT) is defined as a diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information.
- ICTs can be divided into two components i.e. Information and Communication Infrastructure (ICI) and Information Technology (IT).
- The ICT tools may be in the form of audio, visual and audiovisual. The tools of ICT are not single technology but combination of hardware, software, multimedia, and delivery systems.
- The ICT tools can be classified into four categories: (a) informative tools, (b) situating tools, (c) constructive tools, and (d) communicative tools.
- The ICT tools can be used in the different aspects of teaching learning process. It can be used in the pedagogical process and in the process of assessment.
- Integrating ICT in the classroom is a pedagogical skill of the teacher rather than the technical skill and it follows a systematic planning model.

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11.6 MODEL ANSWERS TO CHECK YOUR PROGRESS

E1. Information technology and communication technology

E2. Situating, constructive and situating tools of ICT

E3. Audio, Visual and Audiovisual

E4. Use of ICT tools in the pedagogical process

E5. E-portfolio, Electronic peer assessment, Rubrics etc

E6. Learning as flexibility and responsibility of learning

11.7 SUGGESTED READINGS AND REFERENCE

1. Wright, C. (2000). Issues in Education and Technology: Policy Guidelines and Strategies, London: Commonwealth Secretariat

2. Resta, P. (2002). Information and Communication Technology in Teacher Education: A Planning Guide. Paris: UNESCO

3. UNESCO (2005). Information and Communication Technologies in School. A Hand book for Teachers. Paris: UNESCO.

11.8 UNIT-END EXERCISE

1. Identify different tools of ICT that you can use in your classroom.

2. Select one of the topics from your subjects and develop a lesson plan in a learner-centred approach by using different tools of ICT.

3. What are the advantages of the tools of ICT in the process of assessment?

4. Distinguish between the informative and communicative tools of ICT, and discuss their roles in the process of learning with examples.