

## Module 3

### Integration of ICT in Teaching, Learning and Assessment

#### Learning Objectives:

After going through this module, the learner will be able to

- Explain the meaning of ICT
- Identify appropriate learning resources suitable to the nature of content and teaching-learning strategies
- Explore various eContent, tools, software, hardware for teaching, learning and assessment for different subjects
- Design and implement a teaching-learning plan based on ICT-Content-Pedagogy integration

#### Content outline:

- Concept of ICT
- Scope of using ICT, based on content, context and methods of teaching
- Diverse e-resources and technologies available for teaching-learning
- Criteria for selection of eContent and technology
- ICT integrated teaching-learning plan

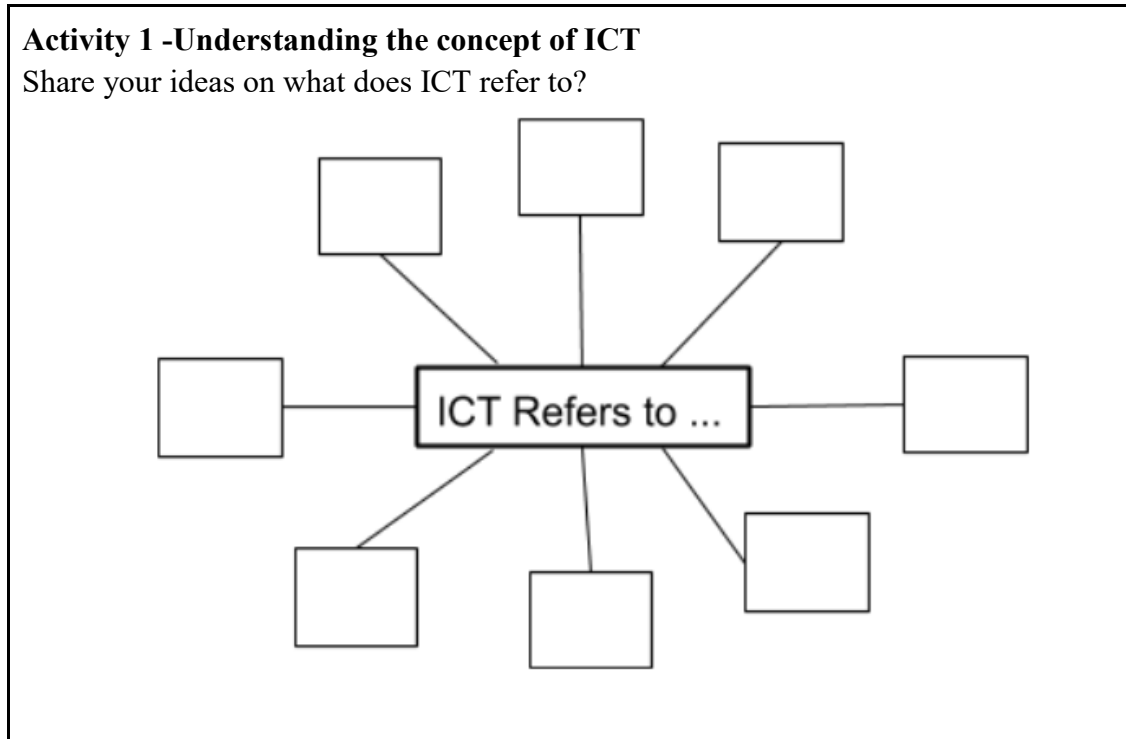
#### Description of the Module:

This module will unfold the concept of ICT and its potentials in teaching-learning. The module aims at preparing a teacher to critically analyse the content, context, method of teaching-learning and to identify appropriate ICT. It also enables to effectively plan the integration strategies.

#### Introduction:

It is a well-known fact that no two individuals are alike. As every child is different, so they tend to learn in a unique way. It is also a fact that learners learn better if they are taught using more than one sense organs. The multisensory strategies usually employed to enhance learning are visual, auditory, kinesthetic and tactile (i.e. hearing, seeing, smelling, tasting and touching). The teaching learning resources including textbooks, local environment, experiences designed within and outside the four wall of the classrooms plays an important role in shaping learning. Also we need to ensure and enable every child as a self learner, independent, critical and creative thinker and problem solver. For this purpose the child requires to collect data/information, analyse, synthesise, make presentations on those data, share with others. These processes help children in concept formation. Therefore, the child needs to go beyond textbooks and use more and more digital and physical resources. In view of the above backdrop, Information and Communication Technologies (ICTs) can play a crucial role to enhance teaching-learning environment. Information and Communication Technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Now a days, understanding of ICT and mastering the basic skills has become a part of the core of education, alongside reading, writing and numeracy.

## Concept of ICT



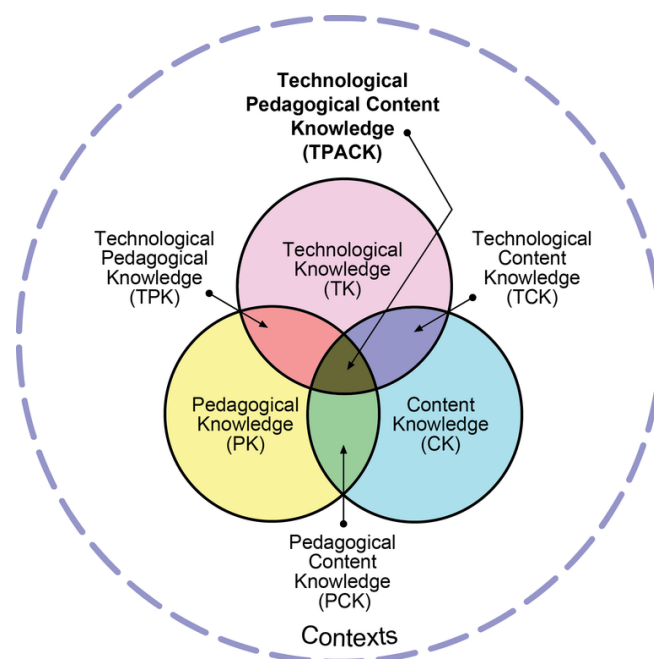
As per UNESCO, ICT refers to a diverse set of technological tools and resources used to create, store, transmit, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players and storage devices) and telephony (fixed or mobile, satellite, visio/video-conferencing, etc.).

How to categorise any technology/device as ICT?

Let us consider the example of smart phone. Smartphone can be categorised as ICT device because it can be used to create a digital image that can be stored and retrieved whenever it is necessary. The digital image can also be manipulated as per requirement that can also be shared and feedback can be received. Thus any device/ technology that is used to create, store, retrieve, manipulate, transmit and receive digital information can be categorized as ICT.



Information and Communication Technology (ICT) has revolutionized all the spheres including teaching-learning. It has an impact on the way new age teacher look at the content, deliver the content using appropriate methods, integrate suitable resources and adopts strategies for the extension of learning and assessment. Keeping in view the advancement in the digital world, teachers need to equip themselves with necessary professional abilities for using ICT for teaching and learning. ICT integration in teaching learning doesn't merely mean the use of internet and digital devices but to consider using these as a means to achieve the objectives and learning outcomes related to the content to be taught and learnt. Teachers must understand how technology, pedagogy, and content are integrated to facilitate learning leading to the acquisition of knowledge. The figure below explains how rapidly-changing potentials of technologies may be effectively integrated with a range of pedagogical approaches and content areas.



Source: <https://commons.wikimedia.org/wiki/File:TPACK-new.png>

## Parameters to be considered while integrating ICT

The major parameters to be considered are Nature of content, Context, Method of teaching/ learning and the Type of technology & its features.

### Parameter - 1: Nature of Content

Is it essential to use ICT for teaching or learning for all content?

In some cases, depending on the nature of the content it is not even necessary to use ICT. For example, while teaching about food, it will be effective to show them the real food items rather than showing images of food from the tiffin boxes brought by students or served in mid-day meal in school. Similarly, while teaching parts of plant, it is better if children are shown the real plant and allowed to touch the plants, feel the texture of leaves, branches, stem, roots/shoots etc. Also they can be provided hands on experience and life skill to sow a seed in a pot/bottle/glass, water the plants, provide sunlight, watch and observe the whole germination process and journey from seed to seed. This kind of experiential learning will be a memorable one for every child in the class, which any PPT, video and multimedia cannot match. Yes, in any biology class dissection of animals and plants is a routine scene. But nowadays dissection of frogs are unethical and illegal. Hence, showing children a multimedia based virtual dissection is a far better option with the teachers. In some cases, it is also important to choose the right media/technology based on the nature of content. Hence the questions to be thought of while choosing media/technology include:

- Is ICT necessary for teaching and learning of a particular content?
- If yes, what type of ICT/ media resource is to be used?

Consider the following examples:

1. Listing of fundamental duties
2. Defining surface area of a solid cylinder
3. Functioning of the Digestive System
4. Reflection on “Whether wars are a good way to end conflicts between countries’

Go through the text given in the table to understand the nature of the content, media that can be used and what are the rationale for selecting that particular media.

Sl. No	Content	Nature of Content	Media that can be used	Rationale for using the media
1	Fundamental Rights in Indian Constitution (Class VIII)	Factual	Visual- Any kind of Presentation like slide presentation, digital poster, digital flashcard etc. on the list of Fundamental Rights	Since the content is factual and the students are just required to list the fundamental rights, an audio visual resource would be redundant. Student, if just provided with the list in the form of any visual aid i.e.

				flashcard, chart, poster etc. would be more suitable to students.
2	Surface Area of a Solid Cylinder (Class-VI)	Conceptual	Demonstration Video	Here, the students have to understand how the surface area of a solid cylinder is calculated. An audio in itself would not be sufficient as the students would have to visualise the cylinder and its different surfaces. A demonstration video, which shows that the cylinder consists of two circles and a rectangle, would lead to a greater and more effective understanding.
3	Functioning of Digestive System (Class VII)	Procedural	Animated Video/ Augmented Reality based mobile apps like Anatomy 4D, bio-digital human etc.	Since the content requires the students to understand a process, only audio, or only visual may not lead to effective learning. If an animated video or AR based resource is used to portray the process of digestion of food, student would be able to understand it better.
4	The Best Christmas Present in the World (Class VIII) Activity - Reflection on 'Whether wars are a good way to end conflicts between countries'	Metacognitive	Discussion Forum	Here, one's own process of decision making has to be questioned and analysed. The discussion forum can be used to discuss the different views & decisions of learners.

This shows that it is essential to understand the nature of the content to identify the scope of using ICT. To make an appropriate selection, teacher should have the knowledge of content as well as various ICT/ media types. eContent can be broadly categorised as shown in the following figure:

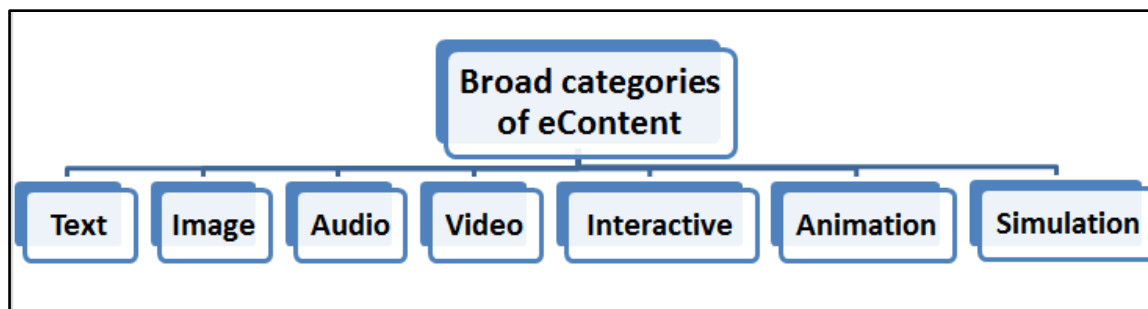


Fig 1: Broad categories of eContent

Teacher will be able to use ICT judiciously when he/she is able to do content analysis and choose the appropriate media based on the nature of content and treatment to be given to enable students understand easily.

### **Parameter 2: Context**

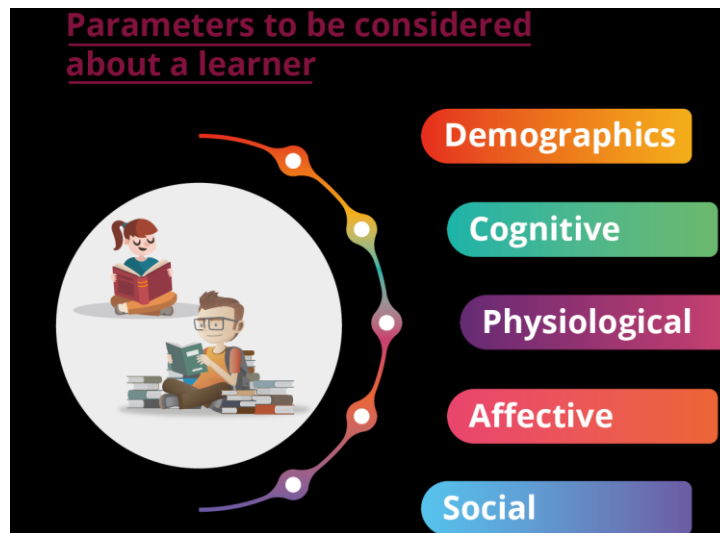
Context analysis is a method to analyze the environment in which an ICT enabled teaching-learning process operates. Context analysis considers the entire environment of a teaching-learning situation.

Reflect on the following

1. What are the ICT facilities available in school?
2. How the support system in the school, motivate use of ICT?
3. What ICT competencies we as teachers have acquired?
4. Could all students use ICT?
5. Are the ICT tools selected based on facilities available and the characteristics of learners?

While analysing the classroom environment, two aspects to be taken care of are infrastructure and human resource. Infrastructure includes the general infrastructure of a classroom like availability of electricity, projection system, internet connectivity, availability of printer, desktop PCs/ laptop/ tablets etc. Human resource refers to the availability of teachers/ technical persons, competency of the teacher in handling ICT etc.

A teacher also need to understand the learner to select appropriate method and ICT tools/ resources for enhancing learning. Four dimensions of the learner that needs to be understood for using ICT are as follows:



1. **Demographic**: A teacher may consider class size, diversity in terms of age, cultural context, socio-economic status, gender, marginality, geographical location and availability/access to technology.
2. **Cognitive and prior knowledge**: Educational level, primary, upper primary, prerequisite knowledge and experience, learning style, level of digital literacy, cognitive ability.
3. **Affective/ Social**: Teacher may introspect her own attitude towards education and learning, online learning environments, attitude towards self, motivation level, interpersonal relationships and area of Interest; the same may be looked at while dealing with students.
4. **Physiological**: A teacher may be aware of general physical and emotional health and special needs of her students. Such awareness will help her decide what medical and therapeutic help to be suggested and what assistive technologies to be adopted.

For example, while providing educational resources to a child who is visually challenged, ICT tools like text to speech plays a vital role in communicating the information. Making the resources open and free provide equal access to children from lower economic background. Thus understanding the learner helps in selecting appropriate ICT and make classroom more inclusive.

### **Parameter 3: Method of teaching/ learning:**

Reflect:

1. How does ICT supports in implementation of various methods of teaching - learning?
2. What are the innovative and integrated methods that can infuse ICT for teaching and learning of specific subjects?

ICT tools/ media become effective only when it is used appropriately with the content and the method of teaching - learning. For example, if a teacher wants to teach the concept of metals and non- metals any one method may be chosen according to her context. One way may be using concept attainment model by giving a group activity to compare and contrast between the given objects and arrive at the definition of metals and non-metals by following these steps:

- Display objects made out of metals (Eg: stapler pin, gold ring) and nonmetals (plastic spoon, wooden blocks) in the class



- Compare and contrast its properties to derive at the essential (Eg: Solid nature, conductor of electricity) and non-essentials (Eg: Shape, colour) attributes of metals
- Define metals and non-metals based on the observed attributes
- Give more examples (Eg: Iron, Copper), non-examples (Eg: Plastic, Wood) and counter example (Eg: Mercury) of metals based on the definition

#### **Parameter 4: Technology/ Tools/ eContent**

Suitable ICT tools and resources may be selected as per the nature of content and their suitability to the method to be adopted.




- Simulating experiment- ICT can be utilised to provide those objects which are not easily accessible in the classroom situation. For example, bringing objects which are metals and nonmetals and testing it for its properties to derive or arrive at the definition of metals and non-metals by comparing and contracting. For this purpose, simulation may be used.
- Slide presentation- Defining metals and nonmetals and stating examples
- Interactive activity (like H5P) - Giving a group activity to compare and contrast between the given objects that are metals and non-metals. Then to classify them based on similarities and derive the definition of metals and non-metals, (watch H5P interactive content on <http://nroer.gov.in>)











Hence, it depends upon the teacher to use the appropriate tool based on the method of teaching - learning. It is also important to understand that a teacher can also choose ICT/ media resources based on the purpose like introducing, explaining, summarizing etc. Thus it is very important to understand the potential of each method and the way it demands ICT to be used as a tools for better comprehension. By analysing the potentials of a particular method and its demand for ICT, a teacher will be able to make a selection of ICT tools/ media appropriately. Several innovative methods/ approaches like flipped class, blended learning, collaborative learning etc. are being used to widely improve the learning experiences. Parameters to be considered by the teachers while choosing eContent or technology tools/ devices are as follows:



S. No.	Parameter	Attributes
1	Target audience	Age group, previous knowledge, social cultural background, learning styles, language, demographic information, emotional development, ability level, social development
2	Content	Accuracy, relevance, content coverage, up-to-date, aligned with curriculum etc.
3	Pedagogical Consideration	Objectives, method of delivering content, media selection, presentation format, clear communication, free from bias, contextualisation to local needs, multiple modes of assessment, learner engagement etc.
4	Presentation	Aesthetics, motivation, innovative/ creative, font, effects, coherence in media elements, chunking and organisation, suitability to learner with special needs, addressing gender equality, multiculturalism etc.
5	Technical	Free from technical glitches, audio visual quality, smooth interactivity and navigation, license etc.
6	Administrative considerations	Cost, delivery mechanism, support, services, training, maintenance, infrastructural and technological requirement, source of procurement/ access.

There are several Free and Open Source Software that can be used in teaching- learning process as well as for the development of eContent. Some of the software are subject specific which can enhance the classroom transaction as well as the learning process. Some of generic/ subject specific software include:

Software	Category
Geogebra 	Subject Specific - Mathematics
KHangman 	Subject Specific - English
Kalzium 	Subject specific – Chemistry

Avogadro 	Subject specific – Chemistry
Bhuvan 	Subject specific – Geography
GComprise Educational Suit 	Subject specific - Primary level (all subjects)
Audacity 	Generic
OpenShot Video Editor 	Generic
Freeplane 	Generic
GIMP 	Generic
Turtleblock 	Generic
Scratch 	Generic
Tux Paint 	Generic

There are several mobile apps that also helps in enhancing teaching - learning. Some of them are:

1. Anatomy 4D
2. Online Labs
3. Quiver
4. Skyview Free
5. Arts & Culture
6. Star Tracker
7. PhET
8. Stop Motion Animation
9. Street View
10. Kahoot etc.

It is the responsibility of the teacher to select the appropriate tool based on the content, method of teaching- learning and the context to make learning effective.

### **ICT-Pedagogy-Content Integration**

ICT integration with content and pedagogy depends on the competencies of teachers. Most of the classes may not be a complete ICT based session rather it will be a blended approach where ICT based activities are blended with the traditional teaching/ learning experiences. Skill of integrating ICT in teaching, learning and assessment develops based on the practice and the Technological Pedagogical Content Knowledge (TPACK). ICT integration should be meaningful such that it promotes construction of knowledge by learners rather than just becoming substitutes of any other traditional teaching aids.

#### **Example for ICT Integrated Activities**

Subject: Science

Class : VIII

Chapter: Crop Production and Management

Topic: Crops and Types of Crops

#### Learning Outcome:

- Define the term agriculture, crops, kharif, rabi, cash, and food crops
- List examples of different types of crops
- Differentiate kharif crop from that of rabi crop, cash crop from food crop, traditional crop from hybrid crop
- Classify crops into kharif, rabi, cash, and food crops
- Appreciate the importance of agriculture to human life

#### Key Ideas:

- Crop - When plants of the same kind are grown and cultivated at one place on large scale
- Agriculture - The branch of science which deals with methods of food production is known as agriculture
- Kharif Crop - The crops which are grown in the rainy season
- Rabi Crop -The crops grown in winter season
- Hybrid Crop - The crops which are produced by cross-pollinating two inbred plants
- Cash/ Commercial Crops - A crop such as tobacco, grown for direct sale rather than for livestock feed

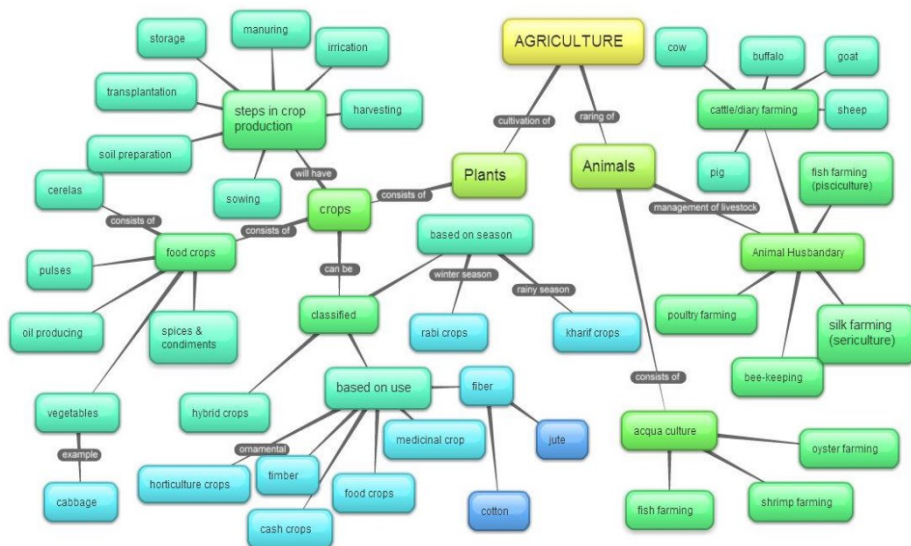
#### Prior Knowledge

- Knowledge of crop, agriculture etc.
- Classification of useful plants and animals
- Uses of various plants and animals

- Nutrition in plants and animals

### ICT integrated learning experiences:

- Using interactive quiz (Example: Kahoot), check the previous knowledge about agriculture
- Using interactive drag and drop activity (Example using H5P), make students recall useful plants and animals
- Students to read on types of crops on the blog (<https://testbook.com/blog/crops-in-india-gk-notes-pdf/>) and will discuss on types of crops based on the reading in groups. As a group, students will prepare a digital infographic based on their reading (using online tools like Easel.ly).
- Teacher can show samples of different types of crops (using images or video) and will explain about each type of crop.
- Students to explore from web the major states producing each type of crops (Website links can be given by the teacher).
- Using map of India showing major crop areas in India ([https://commons.wikimedia.org/wiki/File:Major\\_crop\\_areas\\_India.png](https://commons.wikimedia.org/wiki/File:Major_crop_areas_India.png)) teacher can discuss the crop distribution in India.
- Summing up using mind map (teacher can use the interactive mind map as well)



- Watch for revision (additional resources)
  - <https://youtu.be/mFmCrN9nVXE>
  - <https://youtu.be/IrwRM244IPQ>
  - <https://youtu.be/WZeNnoGETnI>

### Activities for extended learning:

- Find the major crops grown around the world, mark it on world map.

- Participate in discussion forum sharing your reflection on “Pre requisite conditions for growth of each type of crop”. Also create digital poster on “ My role in conserving the environment to foster”
- Find out and list various agricultural activities around you
- Collect information about Genetically Modified Crops (GM Crops)

Assessment:

- Multiple choice test items on types of crops and its examples (H5P)
- Worksheet on classification of crops (Google Form)
- Watch the song “Oats, peas, beans, and barley grow” (<https://youtu.be/-wmYJueP9kA>). Prepare a video presentation in any innovative way expressing your understanding on types of crops

**Summary**

