Module 6

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

Description of the Module

This module discusses 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.

Note for Mentor

- Mentor should ensure the availability of desktop/laptop, projection system, speaker, mobile phone and internet connectivity at the training venue as per the need.
- Mentor to read and understand the content to be transacted during the training. Mentor can use various examples other than the ones given in the module.
- All the resources required for this session to be checked with the systems (Desktop/Laptop) being used at the training venue before starting the session.
- The learners should be informed to bring their mobile/smart phone with internet connectivity (if possible) to actively participate in the session.
- To conduct the activities given in the module, refer to the instructions.

Introduction

It is a well known fact that no two individuals are alike. As every child is different, 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 organ. The multisensory strategies usually employed to enhance learning are visual, auditory, kinesthetic and tactile (i.e. hearing, seeing, smelling, tasting and touching).

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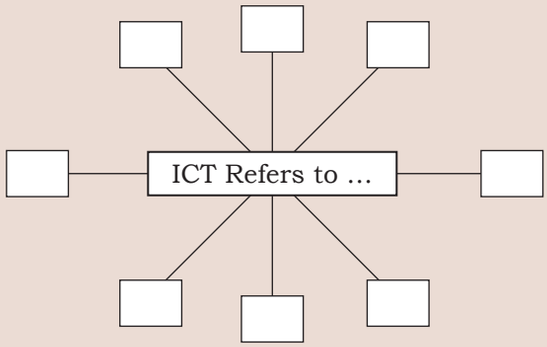
The teaching-learning resources including textbooks, local environment, experiences designed within and outside the four walls of the classrooms plays an important role in learning. Also we need to ensure and enable every child as a self learner, independent, critical and creative thinker and problem 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. 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

Activity 1

Understanding the concept of ICT

Share your ideas on what does ICT refer to?

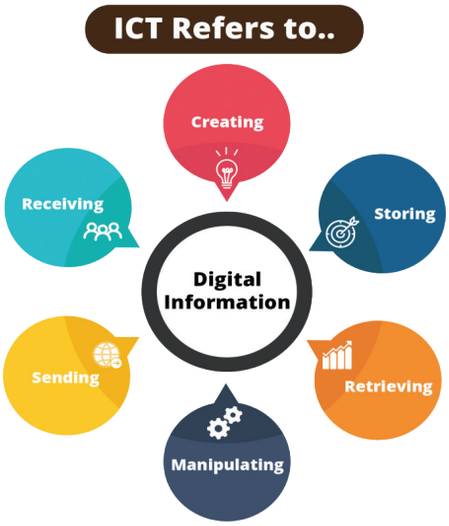


As per UNESCO, ICT refers to a diverse set of technological tools and resources used to create, store, transmit, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting),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

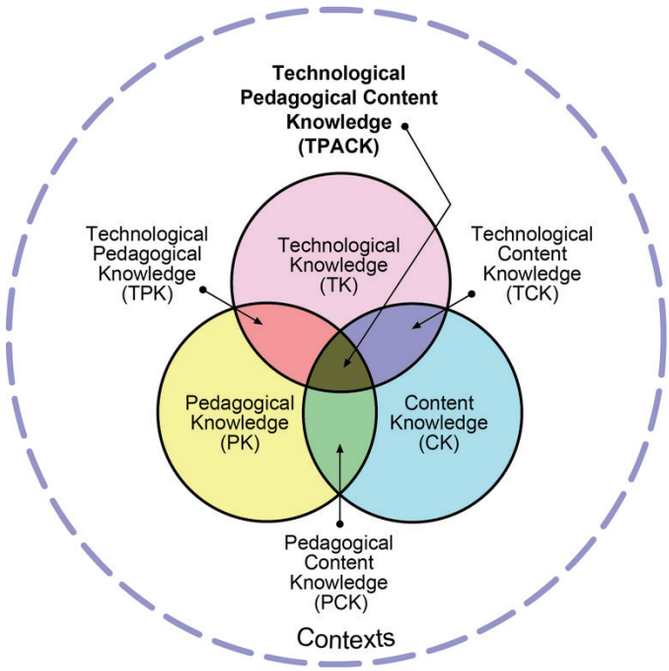
How to categorise any technology/device as ICT?

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 categorised as ICT.



ICT has revolutionised all the spheres including teaching-learning. It has an impact on the way new age teachers 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.



Parameters to be considered while integrating ICT

The major parameters to be considered are context, nature of content, method of teaching/ learning and the type of technology and 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 real plants 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 skills 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 can not match. Yes, in any biology class dissection of animals and plants is a routine scene. But presently 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.

S. 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. Students, if just provided with the list in the form of any visual aid i.e. flashcard, chart, poster etc.
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	Animation Video/ Augmented reality based mobile apps like Anatomy 4D, biodigital 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, students 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"	Metacognition	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 and 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 categories as shown in the following figure:

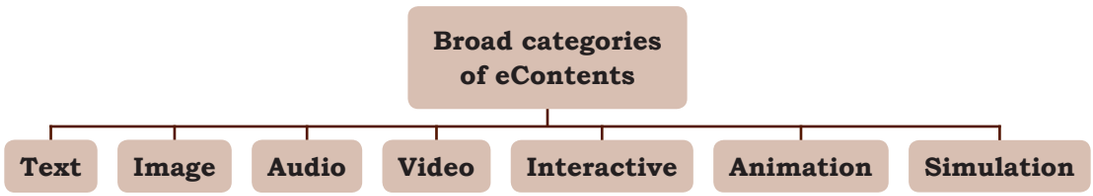


Fig 1: Broad categories of eContent

Teacher will be able to use ICT judiously 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.

Activity 2

Select the subject from the given cards. Select a topic of your choice on that subject. List down the learning outcomes for that topic. Identify at least three key ideas/content that you will teach under the selected topic to achieve the learning outcome. Analyse and classify based on the nature of content (factual, conceptual, procedural, metacognitive).

Parameter 2: Context

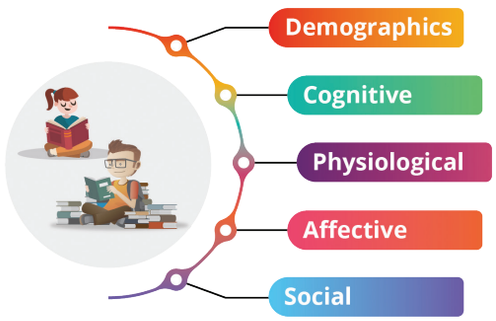
Context analysis is a method to analyse the environment in which an ICT enabled teaching-learning process operates. Context analysis considers the entire environment of a teaching-learning situation.

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 have teachers 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.

Parameters to be considered about a learner



A teacher also needs 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:

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.

Cognitive and prior knowledge—Educational level, primary, upper primary, Prerequisite knowledge and experience, learning style, level of digital literacy, cognitive ability.

Affective/Social—Teacher may introspect her own attitude towards education and learning, online learning environments, attitude towards self, motivational level, interpersonal relationships and area of interest; the same may be looked at while dealing with students.

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 is 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.

Activity 3

Extended activity (Discussion in forum/egroup)

Watch the following videos on two teachers using ICT in different context

https://youtu.be/yhhmcaq-8_w

https://youtu.be/fyXRYb3awfA

Reflect on the following:

- What are the ICT facilities required for teaching-learning the topic given in the activity sheet? Are these facilities available in your school?
- Whether the ICT used/required in the activity is/are suitable for all types of learners in your class? Do you think different ICT is required for different learners?

Parameter 3: Methods of teaching-learning

Reflect:

1. How does ICT support 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 non-metals (Eg: 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-essential (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 examples (Eg: Mercury) of metals based on the definition.

Activity 4

Based on the topics selected in Activity 2, identify appropriate teaching method from the pedagogy card for each content. Discuss the rationale for selecting that method of teaching.

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 non-metals and stating examples.

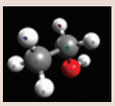
Interactive activity (like H5P)—Giving a group activity to compare and contrast between the given objects that are metals and non-metals. Then to classify them based on similarities and derive the definition of metals and non-metals, (watch H5P interactive content on http://nroer.gov.in).

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, summarising, etc. Thus it is very important to understand the potential of each method and the way it demands ICT to be used as 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:

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 includes:

Software		Category
Geogebra		Subject Specific — Mathematics
KHangman		Subject Specific — English
Kalzium		Subject specific — Chemistry
Avogadro		Subject specific — Chemistry
Marble		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 and 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.

Activity 5

Based on the content and the method selected in Activity 4, identify appropriate ICT tools for each content from the set of ICT cards. Discuss the rationale for selecting that ICT tool.

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 is blended with the traditional teaching/learning experiences. Skill of integrating ICT in teaching, learning and assessment develops based on the practice and the Technology Pedagogy and 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

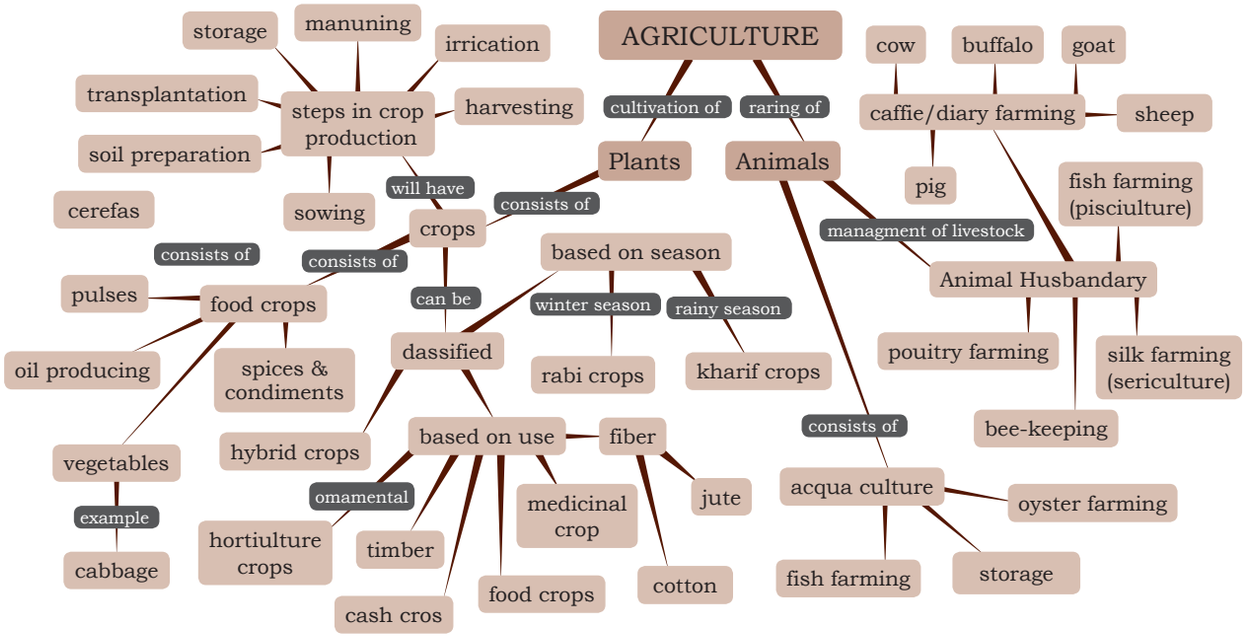
- Crop — when plants of the same kind are grown and cultivated at one place on large scale
- Agriculture — the branch of science which deals with methods of food production
- Kharif crop — the crops which are grown in the rainy season
- Rabi crop — the crops grown in winter season
- Hybrid crops are crops that 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 understanding on agriculture.
- Using interactive drag and drop activity (Example using H5P), recalls 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 discuss on types of crops based on the reading in groups. As a group, students prepare 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 explains about each type of crop.
- Students to explore from web the major states producing each type of crops (Website links can be given by teacher).
- Using map of India showing major crop areas in India https://commons.wikimedia.org/wiki/File:Major_crop_areas_India.png teacher 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/IrwRM244lPQ
  - 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 "Prerequisite 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 of classification of crops (Google Form).
- Watch the song "Oats, peas, beans, and barley grow" (https://youtube/-wmYJueP9kA). Prepare a video presentation in any innovative way expressing your understanding on types of crops.

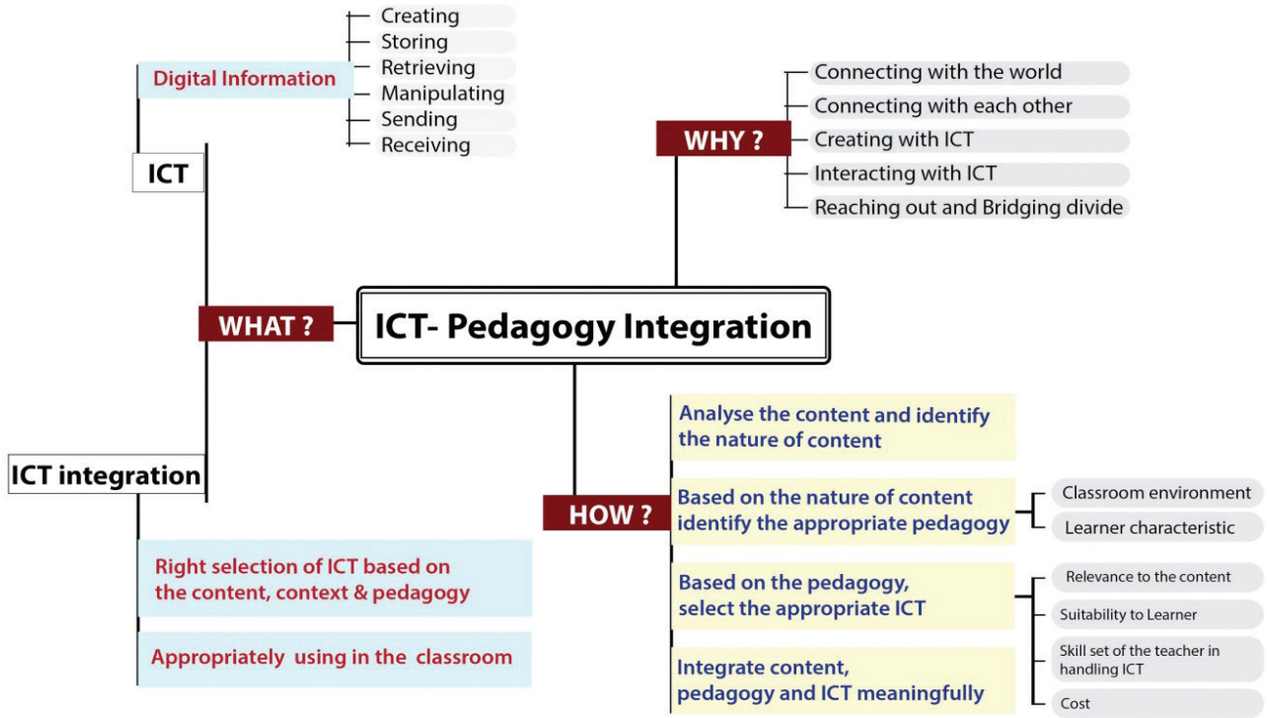
Module 6

Activity 6 (Extended Reading)

Read more on the ICT tools for teachers in the below link
http://cemca.org.in/ckfinder/userfiles/files/Technology%20Tools%20for%20Teachers_Low.pdf

Each group will explore one software and one mobile app and prepare a write up (150 words) on the utility of software and mobile app in teaching-learning. Submit it on portal as portfolio.

Summary



Portfolio Activity

1. Do the following activity and submit your output

Situation 1

Imagine yourself as a language teacher and consider the following situation.

You always teach the poem by singing it and you have shared this experience with other friends to be more effective. Your friends working in other schools also like to teach poems by singing. They request for the poems sung by you. Help them by sending the poem in your voice. Consider any one poem of your choice:

Example 1:

"हरी डाल पर लगी हुई थी
नन्हीं सुन्दर एक कली
तितली उससे आकर बोली
तुम लगती हो बड़ी भली ..."

Example 2:

"My house is red - a little house;
A happy child am I.
I laugh and play the whole day long,
I hardly ever cry..."

Situation 2

Imagine yourself as a Maths teacher teaching class III and consider the following situation.

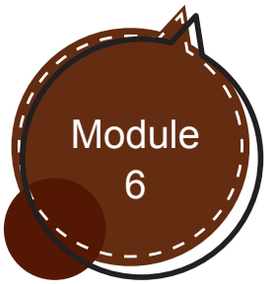
You have demonstrated making an aeroplane by paper folding in class. You instructed students to make an aeroplane at home and bring it to class the next day. Help your students by demonstrating the activity that they can refer to while doing it at home.

Situation 3

Imagine yourself as a teacher teaching EVS at primary stage.

You are good in searching information and resources on the Internet. Your friend who also teaches EVS in other schools wants to teach a chapter "From the Window" for Class IV. She want to show video of a train passing over a bridge on a river to give a feel to her students but she is not good at using internet. Help your friend by accessing and sharing such video to her.

2. Select any topic of your choice from your respective subject. Identify ICT integrated ideas for teaching/learning/ assessment for the selected topic and present thent the following details:
   - Subject:
   - Grade:
   - Chapter:
   - Topic:
   - Learning Outcome:
   - Key Ideas/Content coverage:
   - Prior Knowledge:
   - Plan for ICT Integrated learning experiences:
   - Plan for Assessment:



Instructions for mentors to conduct the activities

Activity 1: Understanding the concept of ICT

Mentor can conduct this activity in two ways:

1. If internet facility is not available: Ask learners to share their views on what ICT refers to and capture all ideas using a mind map tool like Freemind. Based on the responses the mentor needs to discuss about the concept of ICT.
2. If internet facility is available: The mentor can use any collaborative tool like mentimeter and collect responses. Based on the responses mentor need to discuss about the concept of ICT.

Activity 2: Nature of content and scope for ICT

Group learners based on the subject (depending on the total number of students make multiple groups for a single subject). Instruct the learner to continue to be in the same group till the end of the session. Distribute one set of content card to each group. Ask them to select the subject from the given cards. Instruct them to do the following task as group activity:

- Select a topic of your choice in that subject.
- List down the learning outcomes for that topic.
- Identify at least three key ideas/content that you will teach in that topic to achieve the learning outcome.
- Analyse the nature of content.

Instruct the learners to prepare the following details

Subject:
Grade:
Topic:
Learning outcome:
Content coverage:

1. Content 1
2. Content 2
3. Content 3

For example

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

- Classify crops in to 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

Content coverage:

- Concept of agriculture, crops
- Type of crops - kharif, rabi, hybrid, cash, and commercial crops
- Classification of crops based on the characteristics

Randomly ask groups to present. Based on the presentation, discuss on content analysis and the need for such an analysis to identify the scope of using ICT.

Activity 3: Knowing your Context

This activity is to be given as an extended activity to watch and reflect on the following questions in discussion forum/egroup after the session:

1. What are the ICT facilities required to do this activity? Are these facilities available in your school?
2. Whether the ICTs used/required in the activity is/are suitable for all types of learner in your class? Do you think different ICT is required for different learners?

Activity 4: Identifying appropriate method/strategy based on content and context

Continue the activity with the same groups done in activity 2. Distribute one set of pedagogy card to each group. Instruct the group to identify one method/strategy to teach each content identified in activity 2.

Content	Method/ Strategy
Content 1:	Method/ Strategy 1:
Content 2:	Method/ Strategy 2:
Content 3:	Method/ Strategy 3:

Ask random groups to present the selection of the method/ strategy and the rationale for selection. Depending upon the responses, discuss the process of selecting method/strategy based on content and context.

Activity 5: Identifying appropriate ICT

Continue the activity with the same groups. Distribute one set of ICT card to each group. Instruct the group to identify

one appropriate ICT for content, keeping in mind the selected method/strategy.

Content	Method/ Strategy	ICT
Content 1:	Method/ Strategy 1:	ICT 1:
Content 2:	Method/ Strategy 2:	ICT 2:
Content 3:	Method/ Strategy 3:	ICT 3:

Ask randomly, groups to present the selection of the ICT and the rationale for selection. Depending upon the responses, discuss the process of selecting ICT appropriately keeping in view content, context and method/strategy.

If internet connection is available and there is possibility for collaboration, mentor can create the following table and share it with groups to add content based on which the discussion can be done.

Group	Content	Teaching-learning strategy/method suggested	Suitable ICT
Group 1	Content 1	Method/Strategy 1	ICT 1
	Content 2	Method/Strategy 2	ICT 2
	Content 3	Method/Strategy 3	ICT 3
Group 2	Content 1	Method/Strategy 1	ICT 1
	Content 2	Method/Strategy 2	ICT 2
	Content 3	Method/Strategy 3	ICT 3
Group 3	Content 1	Method/Strategy 1	ICT 1
	Content 2	Method/Strategy 2	ICT 2
	Content 3	Method/Strategy 3	ICT 3