SCERT

स्वाध्यायान्मा प्रमदः

UNDERSTANDING OF ICT IN EDUCATION

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING
VARUN MARG, DEFENCE COLONY, NEW DELHI - 110024

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Message

SCERT Delhi is committed to bring systematic reforms and ensure continuous improvement in the quality of education, beginning right from the very initial step of preparing teachers who are aware, equipped and prepared to face the world of their work i.e. the schools to helping the practising teachers to update their knowledge and skills as per the new demands and developments in the field of education.

'ICT' has been long recognised as a useful and relevant subject in education and it gives me immense pleasure to share that State Council of Educational Research and Training (SCERT) took up the enterprise of writing the book on ICT curriculum prescribed for teachers. This book will be helpful not only for the practising teachers and the prospective teachers. It is aimed at knowing the information related to the use of ICT in education and in equipping them with various aspects related to the pedagogy of ICT.

This book would not only facilitate the 21st century teachers to become experts of ICT but also prepare them to be the agents of improving pedagogical practices in ICT education, equipping their students to become true 21st century learners in a world of ICT integrated education.

I found the book to be reader friendly and convenient to navigate. I congratulate the team for their contribution in the field of education and hope the team will continue to mark their name in the education system.

I hope the book proves to be beneficial for teachers to become more effective and resourceful teachers in their class.

Rajanish Singh

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Joint Director

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MESSAGE

Today, ICT has become an instrument that enables various stakeholders to have access to a universal and equitable education. The advancement in Information and Communication Technology has made the world of education more open and free. In today's world, Information and Communication Technology has become an integral and indispensable part of everyday life for people. The scope for technology has increased to the extent that it has become a fundamental requirement for people's work, social and personal life.

In the above context, ICT is an important part of school education and thus, teacher education. SCERT, in its role as an academic guide, develops teaching- learning materials for students and teachers. This year, SCERT undertook the task of developing a book on ICT in education for teachers, keeping in mind the increasing scope of ICT in education and the need of such a material for teachers. This book will serve as a teaching learning companion for the pre-service teachers in their journey of becoming ICT equipped teachers. This book will also serve as a ready reference for practicing teachers.

I appreciate the efforts of the book development team. The book covers not only the essentials of ICT in education but also various aspects related to ICT integrated pedagogy. The book also suggests the resources that can be easily and effectively used in classes.

I hope teachers find this book pedagogically beneficial.

DR. NAHAR SINGH
Joint Director (Academic)
SCERT, Delhi

FOREWORD

The scope of Information and Communication Technology (ICT) in everyday life of people is increasing day-by-day. Education not only reflects societal expectations but also bring change in society. So, integration of Information and Communication Technology in education is not the requirement of everyday life of people due to its widening scope but can also suggest new ways of learning, as emphasized in the time of COVID pandemic when educational institutions explored and made use of ICT in education throughout the world.

Issues that are important in school education become the areas of focus in teacher education also. As envisaged in NEP-2020 and as suggested in the national policy on ICT in School education, integration of ICT in education-school and teacher education is the need of the hour. So, we-SCERT conceptualised the development of a book in an attempt to cover all the aspects of education integrated with ICT. The book begins with introducing the concept of ICT and its curricular and academic linkages. Then the book details out models and approaches of ICT in teaching-learning processes. The book also talks about cybercrimes and plagiarism in ICT integrated education. The scope of ICT is not limited only to teaching-learning process, it goes further to evaluation, documentation and administration aspects of education and the book explores and explains the use of ICT in these areas as well. The book also prepares pre-service andin-teachers to form virtual communities of teaching and learning anduse ICT in education evolve as leaders in the arena of 21st century education.

In a nutshell, the book provides a 360-degree perspective on ICT integrated education. I hope the book will help teachers to become better prepared for effective teaching with ICT integration.

I thank the honourable Minister of Education, respected Principal Secretary Education, Director SCERT and Joint Director (Academics) for their encouragement and support for providing us the opportunity of developing a useful teaching material for teachers.

DR. SAPNA YADAV
Project Director, Diksha

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UNIT-1

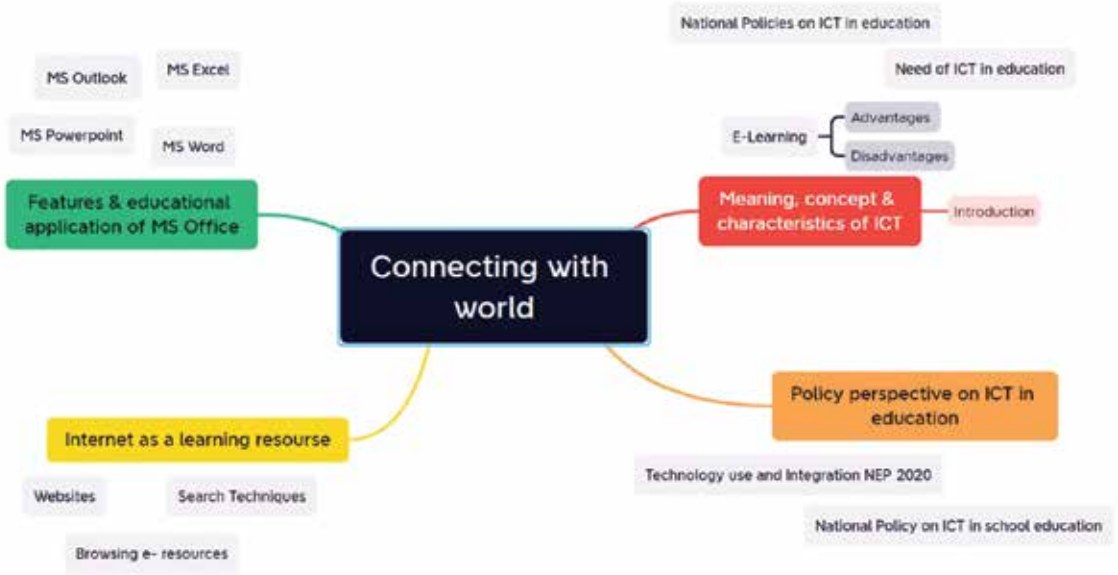
ICT: Connecting with World

UNIT-1

UNIT 1: ICT: Connecting with World

Learning Objectives

- To familiarize learners with the basic concept of ICT
- To develop conceptual understanding of ICT enabled education amongst the learners
- To orient the learners about the importance of ICT integrated learning and the related modalities
- To develop an understanding of the characteristics of ICT in education
- To make the learners understand about the policy initiatives in relation to ICT integrated teaching learning
- To develop an understanding amongst the learners as to how the internet can be used as an effective learning resource
- To equip learners with effective use and understanding of Microsoft Office.



1. Meaning, Concept and Characteristics of ICT

1.1.1 Introduction

A paradigm change has emerged in the field of education around the world. It is widely accepted that traditional classrooms need to be replaced by smart classroom technologies, and that a teacher's role is to facilitate the communication of previously created online knowledge to learners, as well as to provide access and resources to explore the information, facilitate online collaborations, and create digital content for learners. Learners are exposed to a vast amount of material available on the internet; nevertheless, the most difficult task is to filter out the information that is relevant to the learner and adds value to his or her learning. There are several modalities for online education, also known as Information and Communication Technology (ICT) in education, which is a mode of education that employs knowledge and communication technology to assist, enhance, and optimise the delivery of information to learners. But, before we get into what ICT in Education is, let's get acquaintad with some of the associated principles that serve as a basis for ICT based education.

1.1.2 What is E-Learning?

E-learning is an umbrella phrase that refers to a wide range of electronic methods for gaining access to education, as well as the process itself. E-learning is a learning approach that is based on institutionalised instruction but uses electronic resources. While teaching can take place in or out of the classroom, E-learning is primarily dependent on the use of computers, tablets, and even cell phones to access the Internet. It is learning that is done digitally through the use of electronic media. So, in a nutshell, it's a system in which learning, training, or education takes place digitally through the use of a device and can take place at any time and in any location. Among these are virtual classrooms, web-based learning, computer-based learning, digital collaboration, video and audio recordings, interactive television, and other technologies.

Advantages of E Learning

- You have the option of linking the various materials in a variety of forms.
- It is a very effective method of delivering online courses.
- The materials are available at anyplace and at any time because of their comfort and adaptability.
- Web-based learning is accessible to everybody, whether they are part-time students or full-time workers.
- Active and autonomous learning is encouraged through web-based learning.
- You can train yourself at any time and from anyplace because you have access to the internet 24 hours a day, seven days a week.

- It's a really practical and adaptable alternative, and you won't have to rely on anyone for anything.
- You can exercise on a regular basis, as well as on weekends and whenever you have free time. There is no such thing as a "one-size-fits-all" solution.
- You can interact with everybody on-line and clean any doubts you could have with the aid of using the usage of dialogue boards and chat rooms.
- If you don't understand something the first time, you can go back and watch and listen to the video tutorials that are available for audio and video learning.

Disadvantages of E-Learning

E-learning does not have many shortcomings, but the biggest one is that it may be a little more difficult to acquire knowledge only at the theoretical level and apply the acquired knowledge in practice. Face-to-face training may be of concern to some. Most online exams are limited to purely objective questions. There's also the question of online learning programmes' security. The validity of a specific student's work is also a concern. Because anyone, not just students, can complete a project online. Computer-marked exams tend to be pure knowledge-based rather than practice-based.

1.1.3 Meaning and Concept of ICT

The manner of education that employs information and communications technology to support, enhance, and optimize the transmission of information is known as Information and Communication Technology (ICT) in Education.

ICT has been found in studies around the world to enhance student learning and teaching approaches.

Introducing ICT into education is the response to the question, "How can we expand our institution's reach to a wider number of students?"

As a type of e-learning, mobile learning (m-learning) is a growing trend in which education has transcended the physical limits of classrooms and gained mobility. Students have access to information at any time and from any location, and the number of institutions that provide such advanced technological terrains is growing every day.

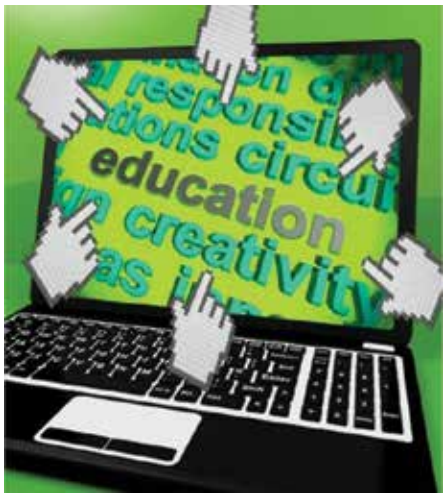
Various Devices/Technology in ICT used:

- Remote access to course materials is possible.
- Lectures, course materials, and a digital library can all be found in online digital repositories.
- Academic management systems that are hosted online or in the cloud

- Using the flipped classroom method
- Using handheld computers, tablet computers, audio players, and projection equipment, among other things.

Also, the growing number of Massive Open Online Courses (MOOCs) such as Coursera and Khan Academy indicates that there is a significant demand for non-traditional learning opportunities. Whether or not our institutions can meet those needs will determine their future.

Need of ICT in Education



In education, ICT enhances involvement, engagement, and knowledge retention. Students become more involved and attentive in their work when ICT is integrated into courses and used as a communication tool as a transactional strategy. This is due to the fact that technology allows for many ways to make it more engaging and entertaining, teaching the same subjects in different ways. Learning becomes more fascinating and engaging for pupils as ICT is introduced in education in schools and other organisations. Through the use of smart boards, the internet, video conferencing, power points, simulations, gaming, animations, and other tools, students can not only gain a range of experiences and knowledge, but they can also establish the groundwork for immersive and experiential learning. It encourages pupils to learn by encouraging their creativity and facilitating their learning. By making the environment interactive, students are given the opportunity to investigate and build a conceptual knowledge that goes beyond what is taught in textbooks alone.

According to UNESCO report, "measurement of ICT in education is thus important to be informed to policy makers to set the national priorities and to develop ICT in education policy."

Enabling ICT in institutions will also be useful for NAAC, NBA, and ABET accreditations.

UNESCO assists its Member States in developing and implementing sector-wide policies and plans to maximise the potential of information and communication technologies to ensure that everyone has access to equitable and inclusive lifelong learning opportunities. For this reason, UNESCO is creating global ICT in Education Policy Guidelines that outline how ICT might help achieve the Education 2030 goals. The organisation collaborates with officials from the Ministry of Education and other stakeholders to develop a set of unified goals for ICT integration in education and subsequently assists in the development of relevant policies and master plans to further these objectives and build supportive conditions. The organization aids in the creation, development, and evaluation of inter-sectoral or sector-wide ICT in education policies and programmes through its policy tools and seminars. UNESCO also assists its Member States in taking stock of what they have learned from other countries. The Organization publishes work on ICT in education policies in many nations on a regular basis in order to identify best practices, analyse new trends, and provide suggestions.

It also arranges regional ICT in education ministerial meetings to enable cross-border knowledge sharing. Overall, UNESCO aims to assist countries in developing policies that leverage the power of information and communication technologies to expand and improve education in line with SDG4.

National Policies on ICT in Education

In 1968, Indian government issued the first National Policy on Education (NPE). The NPE 1968 aimed to promote national progress, a sense of shared citizenship and culture, and national integration. It prioritised a dramatic transformation of the educational system in order to increase its quality at all levels, with a focus on science and technology, the promotion of moral values, and a tighter link between education and people's lives. Following that, the NPE of 1986, as amended in 1992, reaffirmed the importance of universal education as a national goal and a precondition for all-round material and spiritual development, national cohesion, and national self-sufficiency. The NPE 1986, as amended in 1992, emphasised the need of using educational technology to improve educational quality, resulting in two main centrally supported programmes, Educational Technology (ET) and Computer Literacy and Studies in Schools (CLASS). The Indian government developed the Computer Literacy and Studies in School programme after recognising the value of ICT (Interactive Classroom Technique) in education.

(CLASS) was started as a trial project with the debut of BBC microcomputers. A total of 12,000 such computers were received and delivered to secondary and senior secondary schools through state governments as part of this project. . During the 8th plan, this plan was adopted as a centrally sponsored plan (1993-98). The important role ICT can play in schooling is also recognized by the 2005 National Curriculum Framework (NCF). It discussed important aspects of smart school formation that should be demonstrative of technology. The Indian government's flagship education program, Sarva Shiksha Abhiyan, includes an extension to the use of ICT as a Component of Excellence (SSA).The Central Advisory Board for Education (CABE) included the use of ICT in school norms in its 2005 Universal Secondary Education report. The Information and Communication Technology (ICT) in Schools program was introduced in December 2004 and revised in 2010 to provide secondary and high school students the opportunity to develop ICT skills and learn through computer-assisted learning. Government and government-aided secondary and higher secondary schools are currently covered under the scheme. Financial aid is available for the purchase of computers and peripherals, instructional software, teacher training, e-content development, Internet connectivity, and the establishment of smart schools. To date, the ICT in Schools initiative has been approved to support approximately 87,033 public secondary and secondary schools. ICT literacy is defined as a competency level in the ICT National Policy for School Education. Depending on the level of ICT implementation, students or teachers may move to different levels. The levels are structured into three general categories, basic, intermediate, and advanced, and are independent of specific classes (for example, sixth or seventh grade). Local considerations must be taken into account when calculating the time length, depending on the school's strengths .The new strategy aims to equip schools, instructors, and students with digital tools. The use of technology in education is also stressed in the NEP 2020. NEP, 2020, suggest that e-courses will be prepared in regional languages, virtual labs will be developed, and a National Educational Technology Forum (NETF) will be established. In addition to English and Hindi, content will be provided in a variety of regional languages. It has also prioritised increasing assets for socially disadvantaged people. It will also create educational software that is Divyang friendly.

Characteristics of ICT

- Students are at the centre of the teaching-learning process, which encourages them to think critically and creatively.
- Computing devices aid in the development of 21st-century abilities through mastering digital skills, instilling digital literacy in learners, and enabling them to use it successfully for knowledge creation.
- A topic becomes more important when it is presented dynamically as students actively participate in the teaching and learning process.
- Students can learn at their own pace and in their own environment with versatile learning, depending on their particular learning needs. Teachers can use adaptive learning software to improve their students' teaching and learning.
    - Information is collected, kept, used, manipulated, managed, transmitted, and received.
    - A broader choice of communication platforms is available.
    - Information can be accessed quickly.
    - Bringing geographically separated locations together.
    - Catering to individual differences
    - Pupils will have more possibilities to learn.

It can be utilised in education in the following ways:

- To transmit information, you can use an internet facility or a CD ROM.
- To make it easier for students with special needs to communicate.
- To enhance spatial awareness and psychomotor control through the utilize of electronic toys.
- To facilitate collaborative writing and sharing of knowledge utilizing web devices such as mail, to allow a diverse group of students to participate in video conferencing or other forms of teleconferencing.
- To allow instructors to communicate and exchange ideas in order to advance their careers.
- To conduct cross-disciplinary studies in an effort to improve the educational process.

1.2 Policy perspective on ICT in Education

1.2.1 Technology Use and Integration NEP 2020

Introduction:

It may be a comprehensive system centring on essential and higher instruction levels in India. The Union Cabinet has affirmed the National Instruction Approach 2020. The Union Cabinet has affirmed the National Instruction Approach. NEP2020 replaced the existing 1986 national education policy. It is a comprehensive framework focusing on primary and higher education levels in India.

The Union Cabinet has approved the National Education Policy 2020. Two committees were formed, and their recommendations were considered when the new policy was drafted. Typically a noteworthy day since the nation features am unused instruction approach after a long time of 34 years. The NEP 2020 emphasised the use of innovation in instruction. The use of technology in education was stressed in the NEP 2020.

E-courses in regional languages will be developed, as will virtual labs, and a National Educational Technology Forum (NETF) will be established. In expansion to English and Hindi, e-content will be produced in an assortment of regional languages in the NEP 2020. Technology will be used by the ministry in education planning, teaching, and, most importantly, assessment. According to the new strategy, the ministry will adopt self-disclosure regulations and a minimal human interface in the education sector. It has also prioritised increasing assets for socially disadvantaged people. It will also create educational software that is Divyang friendly. The new strategy aims to equip schools, instructors, and students with digital tools.

India leads the world in information and communication technologies, as well as other cutting-edge sectors such as space exploration. The Digital India Campaign contributes to India's transformation towards digitally empowered society with a knowledge economy. While education will be important in this transition, technology will also play a critical part in improving educational procedures and outcomes; thus, the relationship between technology and education is bidirectional at all levels.

There's no denying that the National Education Policy 2020 is revolutionary in every manner. While the bill addresses wide range of issues including the need for early childhood care, comprehensive education, and curriculum reform, the interplay of education and technology may be a common string that runs through it all. Over the last decade, India has transformed into an "information intensive culture," and there is a growing demand to utilize technology in the field of education. According to the policy, "extensive use of technology in teaching and learning, removing linguistic barriers, improving access, and education planning and management" are among the basic concepts governing the education system.

Students and teachers have been forced to re-imagine traditional learning and teaching practices in the current 'pandemic circumstances it depicts the vision of instruction for future eras and will be a significant apparatus within the development of a "self-reliant" India.The Policy's introduction at this key moment is that it depicts the vision of instruction for future eras and will be a significant apparatus within the development of a "self-reliant" India.

Thrust of technological interventions:

- Teaching- learning and assessment processes
- Advancing teacher preparation and professional development
- Streamlining educational management and administration
- Getting rid of language obstacles
- Improving Educational Access
- Access to Divyang students

NEP 2020 perceives the significance of:

- Utilizing the benefits of technology while being aware of the potential hazards and perils.
- Carefully planned and fittingly scaled pilot deciding the benefits of advanced/ online education.
- Optimising and expanding existing digital platforms, as well as continuous ICT-based educational efforts, to meet current and future demands.
- Using innovation for online and advanced instruction enough to address concerns of value.

Key Aspects of the Policy Dealing with Technology:

- **Education at the Primary Level**
  The arrangement perceives the scope of innovation in helping instructors, bridging and guaranteeing broader instructive get to (particularly for differently-abled children). It is additionally proposed that coding be included in school educational program as a necessary skill for kids to memorize. The arrangement moreover perceives that innovation may be a valuable instrument in helping educator with instruction and underpins the utilization of advanced stages for online instructor instruction.
- **Higher and Professional Education**
  The Policy recognises the role of technology in addressing a variety of societal concerns and tries to encourage interdisciplinary research and development. Higher Education Institutions ("HEIs"), for example, have been encouraged to establish start-up incubation centres and technological development centres, and a National Research Foundation has been proposed to foster a research culture. The Policy calls for the formation of the National Educational Technology Forum ("NETF"), which will serve as a forum for the open exchange of ideas about the utilization of technology in education.
- **Education Administration**
  The Policy's focus on using technology to promote efficiency and transparency of regulatory agencies such as the State School Standards Authority and the Higher Education Commission of India, as well as its four verticals, is an intriguing aspect (National Higher Education Regulatory Council, National Accreditation Council, Higher Education Grants Council and the General Education Council).

Key Concerns:

While the Policy has done an excellent job of incorporating technology into 'education,' there are some concerns that need to be addressed in the Indian context.

- According to a government poll performed from July 2017 to June 2018, only 4.4 percent of rural homes have computers, compared to 23.4 percent of urban households, and roughly 14.9 percent of rural households have internet access, compared to 42.0 percent of urban households.
- In the framework of education, it is critical that every student, in both urban and rural locations, has exclusive access to digital gear, such as smartphones, PCs, and tablets. Currently, the majority of pupils from low-income families have limited or no access to specialised digital equipment, the internet, or even electricity.
- The 'human-element' of education cannot be disregarded, and technology should only be utilised to supplement the learning process. It is also important to evaluate how technology is utilised, processed, transported, and stored, and to incorporate the essential measures to protect users' privacy and prevent data theft.

1.2.2 National Policy on ICT in School Education

Introduction

The majority of poor countries lack a coordinated policy on ICT in school education. They may have determined that a separate policy on ICTs in Education is unnecessary, or they may as of now have

an IT policy with segments on Instruction or a telecom arrangement with references to both IT and Education. Indeed it is obvious that ICT approaches don't and cannot exist in separation, the basic foundation of a reported national ICT policy for School Instruction has importance in and of itself. They must consider a variety of different policies and frameworks, including education, information, trade, and investment policies, as well as cultural and language policies.

The Computer Literacy And Studies in Schools (CLASS) Project was founded in 1984-85, recognising the role of ICT in education. In addition to the interactive radio programme, the unique Educational Television channel 'Gyan Darshan' was established today to provide satellite-based education across the country. In December 2004, the ICT in Schools Scheme was launched in collaboration with states and union territories to provide a window of opportunity for secondary school students across the country. While the focus has been on computer literacy, the benefit is now being released in the use of IT tools for the production of e-content in computer aided learning activities and student self-learning.

Vision of the 'future classroom' in Indian schools in the digital age:

The classroom of the future would be a location where all students may go to school and engage in a meaningful educational process.

Effective use of ICTs in Education can decrease the stress on India's socio-economic fabric, as withessed by the Indian IT industry. Today's education must be linked to prospects for economic advancement through improved learning, comprehension, and exposure to a global context. Success would be assessed not just by test results, but also by the degree of learning, the number of students pursuing further education, research, and the number of students pursuing jobs in the knowledge economy, rather than by an overall improvement in India's economic situation.

Need of specific Policy on ICT in School Education:

- A National Policy on ICT in School Education will allow the government and people of the country to establish and participate in an "envisioning exercise" that will help us see where all of this money is going. It will aid in the channelling of government funds and tax payers into long-term educational development mechanisms that will benefit future generations of students.
- A national policy on ICT in School Education will inevitably need to connect to the country's national education goals and improve existing education policies and frameworks. Traditional educational delivery techniques are not designed to encourage the use of technology tools all of a sudden. To enable the country's education system to absorb and adapt to new era digital tools, deep rooted, systemic adjustments are required. This requires an intensive examination of existing frameworks as well as a clear grasp of their capacity to adjust to alter.
- A National Policy on Data and Communication Innovations in School Education will bolster the use of modern innovation apparatuses in instructing and learning. This will help in information generation and sharing among key partners and the professional community.
- A National Policy on Information and Communication Technologies in School Education will support the use of new technology tools in teaching and learning. This will aid knowledge production and sharing among key stakeholders and the practitioner community. New collaborative learning tools and free and open access to knowledge are at the heart of ICTs. Without the backing of sustainable frameworks and regulations, technology can certainly influence outreach, access, and the creation of new instruments for learning and teaching, but these are less likely to arise on their own.

Policy goals of ICT in school:

- Establish a procedure for improving ICT expertise.
- Develop a workforce of ICT experts, including teachers and students, who can deploy and use ICT features to help society and the nation.
- Foster a culture of collaboration, cooperation, and sharing that encourages the optional use of ICT in education and maximises the benefits.
- Create a repository of ICT and ICT-enabled tools and resources that all students and teachers should have access to.
- Encourage the creation of a local quality centre to allow qualified students and instructors to contribute to the creation and usage of digital materials.
- Establish a pool of instructors and schools to facilitate resource sharing, teacher training, and student counselling and academic support.
- To fully use the potential of ICT in school education, strive for continuous development in ICT tools and ICT-enabled activities through research and experimentation.
- Using proper ICT motivates society and makes it easier for people to engage in the educational process.

ICT literacy has been characterised in terms of level of competence:

1st level (Basic level)	2nd Level (Intermediate)	3rd Level (Advanced)
Level 1 is intended to teach basic computer skills such as how to turn on and off computers, how to use the internet and search engines, how to use input and output devices, how to use digital devices, how to use the office, and how-to troubleshoot basic problems, according to the policy.	At this level, the user can install and uninstall software, solve application difficulties, search the internet for required information, create and modify content using digital devices, and so on.	This level, as the name implies, requires the user to extract information from a database and evaluate the data, as well as awareness of cyber dangers, copyright regulations, and the ability to participate in a web-based network for cooperative and collaborative learning.

ICT will benefit education in the following ways, according to the policy:

- **Processes of teaching and learning that are aided by ICT:**

This procedure makes use of several equipment and approaches. Projectors, multimedia-based modules, virtual learning environments, and modifying the classroom setting to use ICT tools are all examples of resources targeted at increasing the teaching and learning process' quality and efficiency. It guarantees that instructors are involved in the selection and evaluation of digital content by allowing them to vote competent teachers, as well as encouraging them to generate digital content of their own as well as sharing them.

- **ICT for Skill Development:**

The policy called for the creation of job-oriented modular courses for vocational students. Students will receive instruction in hardware, software, tools, and other areas based on their preferences. They will receive appropriate coaching and counselling to assist them in determining their career path. ICTs will have to be incorporated into the teaching and learning process at the vocational training institute.

- **ICT for Children with Special Needs:**

ICT would help India achieve its inclusive education goals by compensating for special needs educational policies deriving from disability. It will make screen readers, Braille printers, and embossers more accessible to people with disabilities.

- **ICT for Open and Distance Learning:**

ICT will serve as a catalyst for Open and Distance Learning's success. ICTs will open up new options for dropout students who are unable to continue their formal education through open and distance learning.

1.3 Internet as a Learning Resources: Using Websites, Search Techniques, Browsing e-resources

1.3.1 Introduction

The rapid growth of computer and web technologies will almost certainly result in their usage in a variety of educational activities to establish a venue for information and education.

It will enable students to organise their learning so that they work actively, with interest, and excitement not only in the classroom, but also at home, where they can see and evaluate the consequences of their work. This difficulty can be solved by combining traditional teaching methods with multimedia, including computer and Web resources. The employment of computers in the classroom allows for a more mobile, differentiated, personalised, and interactive learning experience.

Today's computer is a tool that can be used by everyone. It can replicate a variety of linguistic scenarios and respond fast and efficiently to the student's actions and demands.

As the Web develops dangerously, look motors play an increasingly imperative part for clients in getting to viably online data. As of late, it has been recognized that an inquiry is regularly activated by a look errand that the client needs to achieve. Additionally, numerous web pages are particularly planned to assist fulfil a certain errand.

Subsequently, learning covered up errands behind inquiries and web pages can offer assistance look motors to return the foremost valuable web pages to clients by assignment coordinating.

1.3.2 Internet as a Learning Resource:

Because of the high expense of purchasing books or other printed media used in learning, the internet is required as a learning resource. This is a factor that can make the teacher's job more difficult. As a result, the internet is one of the most effective and efficient learning resources available, with relatively low access prices. Even while teachers recognize that utilizing various learning resources as part of learning strategy is very supportive or helps to boost students' knowledge of the subject matter, many teachers continue to organize learning activities without the support of various learning resources.

The internet's advantage as a learning resource is that it allows for speedy data sharing between users. The internet is also a good source of up-to-date information. Because of the vast number of internet service providers, search results from the internet immediately focus on the sub-topics that will be searched and can be reached from a variety of locations.

1.3.3 Website:

The World Wide Web, or simply Web, is a method of gaining access to information over the Internet. It's a model for exchanging information that's developed on top of the Internet. The HTTP protocol, which is merely one of the languages spoken on the Internet, is used to convey data on the Web. Web also makes use of Internet browsers like Internet Explorer, Google, Chrome and Firefox to access Web documents known as Web pages, which are linked to one another via hyperlinks. Graphics, music, text, and movies can all be found in web documents.

The Information can be disseminated through the Internet in a variety of ways, including through the Web. Email, Usenet newsgroups, instant messaging, and file transfer protocol are all utilized on the Internet, not only the Web.

1.3.4 Search Technique:

A search technique may be seen as an approach to using the Web. A search technique, for example, is using Google; a reading strategy is using links in a Web document. Within the context of a specific task, a strategy may be suitable or insufficient.

Users and IR Systems interact in planned or situational ways to produce search methods. In other words, it emphasizes a functioning interactive reply that has been developed for a certain context. The 'action plan' for retrieving information is called a search strategy.

A search technique is made up of a series of methods that are carried out in a specific order and take into consideration both planned and unplanned factors. In terms of this work, this definition might be interpreted as a strategy for completing academic research. Internet search methods are the organizing of search keywords and symbols in order to conduct effective web searches and to broaden and narrow search results as needed.

1.3.5 Browsing E- Resources:

The practice of searching for learning resources to supplement the material that will be provided to pupils is known as searching. In this scenario, all information required and connected to the information's source is unknown. As a result, it makes use of search engines. One of the methods is to conduct a search. On the app, there are features to help you find what you're looking for. Search engines take this into account, a collection of websites from around the world that there are billions of web pages on the internet. Only by doing so may you gain access to the search process that will be carried out using the term, and several site links will be displayed by the search engine as well as a brief summary.

The Search Engine is one of the most commonly used internet tools by internet users all over the world. Teachers can use search engines to identify learning resources in the educational realm.

Furthermore, as compared to other learning sources, search engines have advantages in terms of practicality. Teachers can use search engines to get the information they need by typing in related keywords. Teachers can use search engines to become alternate learning tools.

1.4 Features and Educational Applications of Microsoft Office

1.4.1 Introduction

Microsoft Office is a powerful tool that allows you to express yourself, get things done, and stay connected while on the road. Simply sign in for a personalized experience and access to the most recent Office programs, with new and improved features being released on a regular basis.

Microsoft Office may be a cloud-based efficiency and collaboration suite from Microsoft that combines all of the company's existing online applications (Word, Excel, PowerPoint, One Drive, TEAMS and Outlook) into a single benefit, with Skype for Commerce and Microsoft Groups serving as the primary communication and collaboration apparatuses.

Microsoft Office may be a closed-source computer program office suite containing diverse applications, counting MS Word, MS Excel, MS PowerPoint, MS Outlook, MS TEAMS and MS One drive. Whereas these are called Applications, Microsoft Office is called Program.

1.4.2 Features and Educational Applications of Microsoft Office

Microsoft Word

The first and most important person to address is, of course, our assignment partner. Microsoft Word is a word processing program. It's most likely the one application with which we're all familiar. MS Word provides us with everything we require to write at our finest and most productive levels.

Features:

MS Word Editor - The MS Word editor will assist you in correcting your typing errors and punctuation, as well as provide you with intelligent word ideas, which we all want when writing.

Inserting Pictures - Adding pictures and infographics to our documents brightens them up and gives them a web page feel. MS Word's extremely user-friendly features will assist you in creating the best possible word document.

Translation - The wonderful translation feature is the icing on the cake for all of MS Word's capabilities. It allows you to document in multiple languages on a single plane. To read and compare, you don't have to switch between panes.

References - Adding references might be difficult, especially if you must adhere to a strict format. Fortunately, MS Word takes care of everything for you with a few simple commands.

Shortcuts- MS Word provides keyboard shortcuts for all of its actions, allowing you to edit and write your documents in one spot.

MS Excel

In today's world, a spreadsheet is an essential and valuable tool. MS Excel is a computerized spreadsheet that can handle spreadsheets that are as lengthy as 20 A papers. Now, if you want to take control of your life, the first things you'll need to do is plan ahead financially and walk in a systematic manner.

Features:

Arithmetic solutions - Adding and subtracting numbers from a long list of sections is a breeze. You can use Ms. Excel to perform computations on the entire spreadsheet or just a piece of it.

Managing Expenses - As a human being, we all have expenses. Some of them are legitimate, while others are associated with luxury items or shopping binges. Ms. Excel will assist you in keeping track of all of your costs and making financial plans for the future.

Formatting - Its formatting tools might assist you highlight or colour rows, columns, and sections for a better examination.

Charts - Analyzed charts, which provide visual representations of all of your expenses, are simply a click away.

MS PowerPoint

MS. PowerPoint is a program that assists you in creating digital presentations and lectures. Here are several entertaining and useful Microsoft PowerPoint programs.

Features:

Slide Show - You can create your own slideshow using your favourite photos.

Customization - You can personalise your slides to meet your specific requirements. You may customize the format, fonts, and images, as well as include analysis charts, links, and more.

Making Notes– It is quite helpful in organising subject notes by chapter or topic.

Microsoft Outlook

Microsoft Office is an online and offline emailing application with several features not available on standard email servers.

Features:

Syncing - It is a programme that allows you to sync all of your data.

Email - Outlook's email is the key to all of Microsoft's programmes, containing all of your current data.

To-do list - Using the to-do list tool, you can prepare ahead of time and add critical activities to your account.

Offline Editing - You can examine your existing emails while offline and schedule emails to be sent out.

Calendar - You may use the calendar to synchronise your schedules, add contacts, schedule events, and much more.

Microsoft One Drive:

Low storage capacity on a device is no longer an issue with Microsoft OneDrive. Teachers and students can use the OneDrive Files On-Demand functionality to securely view and work on all of their OneDrive files without having to download them to their computers. Indeed as schools return to conventional classroom learning, utilizing One Drive to store information within the cloud calms

IT of the authoritative stack of reinforcements, costly capacity frameworks, and catastrophe recuperation. IT can too inquire teaches and understudies to naturally adjust anything spared in Windows Known envelopes (such as Desktop, Records, and Pictures) on their computers to OneDrive utilizing the Known Organizer Move Gather Arrangement to guarantee that all of their records are synchronized to the cloud.

Features:

1. At any time, you have unlimited file access
2. Makes files available for collaboration from anywhere
3. Platform for file organisation
4. Free up space on your device
5. Content that may be shared among teams, big or small
6. Synchronization experience that may be customised (for admin)
7. Files and information should be stored in a secure manner
8. Multimedia is supported
9. Integrate seamlessly with other Microsoft products (including 365)

MS TEAMS:

Microsoft Teams is a Microsoft 365/Office 365 collaborative workspace that acts as a single hub for workplace interactions, collaborative teamwork, video conferencing, and document sharing.

Features:

Teams and channels - Teams are made up of channels, which are discussion sheets between teammates.

Conversations within channels and teams - In the General channel, all team members can watch and add to different conversations, and they can use the @ feature to invite other team members to different conversations, similar to Slack.

A chat function - Most collaboration apps include a basic chat feature that allows teams, organisations, and individuals to communicate with one another.

Document storage in SharePoint - Every Microsoft Teams team will have a SharePoint Online site, which will have a basic document library folder. All files shared across all discussions will be saved to this folder automatically. For sensitive data, permissions and security options can be modified.

Online video calling and screen sharing - Take advantage of seamless and quick video conferences with colleagues or clients outside your company. On a collaborative platform, a good video call function is a must-have. Straightforward and speedy desktop sharing for specialized help and multi-user real-time collaboration are too accessible.

Online meetings - With an online gatherings function that can have up to 10,000 individuals, this device can assist you make strides your communications, company-wide gatherings, and indeed preparing. Anybody from exterior or interior a company can take part in online meetings. A scheduling tool, a note-taking programme, file uploading, and in-meeting chat messaging are all included in this function.

Know Your Progress:

1. How is Microsoft Office a useful tool in education?
2. Explain different applications of Microsoft office.
3. Explain 'Microsoft Teams' as a useful teaching learning tool.
4. What do you understand about ICT in education.
5. Discuss the need and importance of ICT in education.
6. How as a teacher can you integrate ICT in education.
7. Discuss about the characteristics of ICT in education.
8. What are the aims of using technology and integration according to NEP 2020?
9. What are the aspects of technology in NEP 2020 at different levels?
10. What are the key concerns of use of technology in NEP 2020 according to the Indian context?
11. How Technology and Integration came into existence under NEP 2020?
12. In the digital age, Indian schools have a vision of the "future classroom." Explain.
13. How ICT will benefit education according to the policy?
14. What are the objectives or goals of ICT in the classroom under NEP 2020?
15. Explain "Internet as Learning Resource"
16. How websites, searching techniques and browsing can be useful as Learning Resources?

Augmented Learning:

1. A Video Tutorial on Features and Educational Applications of Microsoft Office
2. A video tutorial on the basic meaning, concept and characteristics of ICT in education. Link: https://youtu.be/JEovz_NRM4c.
3. A video tutorial on the "Technology Use and Integration" NEP 2020. Links: https://youtu.be/ccfQ23w1-ko.
4. A video tutorial on "National Policy on ICT in School Education"
5. A video tutorial on the Internet as a Learning Resources: Using Websites, Search Techniques, Browsing e-resources. Link: https://youtu.be/dIiRFsScXnA.

Points to Remember

- E Learning is the learning that is carried out digitally using the electronic media.
- The manner of education that employs information and communications technology to support, enhance, and optimise the transmission of information is known as information and communication technology (ICT) in education.
- In education, ICT enhances involvement, engagement, and knowledge retention.
- ICT Literacy is defined in terms of levels of competence in the National Policy on ICT for School Education.
- In the NEP, 2020, e-content will be generated in a variety of regional languages in addition to English and Hindi.
- Technology will be used by the ministry in education planning, teaching, and, most importantly, assessment.
- According to the new strategy, the ministry will adopt self-disclosure regulations and a minimal human interface in the education sector.
- It has also prioritised increasing assets for socially disadvantaged people. It will also create educational software that is Divyang friendly.
- The new strategy aims to equip schools, instructors, and students with digital tools.
- The internet's value as a learning resource is that it enables people to share info quickly. Up-to-date information can also be found on the internet.
- Microsoft Office is a wonderful tool for expressing yourself, getting things done, and staying connected while travelling.
- Microsoft Office could be a Microsoft cloud-based efficiency and collaboration suite that combines all of the company's existing online applications (Word, Excel, PowerPoint, One Drive, TEAMS and Outlook) into a single benefit, with Skype for Commerce and Microsoft Groups serving as the essential communication and collaboration tools.

UNIT-2

ICT for Teaching-Learning: Possibilities and Concerns

UNIT-2

UNIT 2: ICT for Teaching-Learning: Possibilities and Concerns

Learning Objectives

- To explain in detail the concept of NTeQ Model.
- To orient the learners about the need, relevance and criteria for authenticating of ICT resources.
- To familiarize learners with the basic concept of ICT-based Teaching-Learning approaches in schools.
- To develop an understanding of the Educational Radio and TV, Mobile Learning, Teleconferencing/ Video Conferencing.
- To illustrate infusion of ICT in lesson planning and curating digital resources.
- It creates understanding sakshat and swayam portal for online access.
- To familiarize learners with digital story telling and story boarding.
- To explain the concept of Cyber Crime.
- It describes about Proprietary and Open-Source Software

2.1 NTeQ Model

2.1.1 NTeQ model-An Introduction

1. NTeQ Model stands for
   - N-Integration
   - Te-Technology
   - Q-Inquiry
2. The NTeQ (iNtegrating Technology for inQuiry) model creates available a framework of:
   - an environment
   - for learners
   - for using computers as tools
   - to build a strong educational contextual
   - while solving significant problems.
3. This model is a ten-step lesson plan design.
4. It is practice for integrating technology into problem-based, inquiry-based besides project-based learning.
5. It is not an instructional delivery or drill and practice tool. However, It is an methodology in which lesson planning that focuses on using technology as a learning tool.

2.1.2 Meaning of NTeQ Model and Definition

The iNtegrating Technology for inQuiry (NTeQ) model creates available a framework in which an environment for learners is created for using computers as tools to build a strong educational contextual while solving significant problems.

Definition: A model in which a professional integrates a computer and its applications in developing a problem based or inquiry based lesson for students to enrich themselves with technological competencies in an environment that encompasses access to multiple resources and activities teaching-learning process.

2.1.3 NTeQ Philosophy

To implement the NTeQ model successfully the fundamental philosophy that supports the NTeQ model covers the following five components:

1. **Teachers** to become technologically competent go far away from computer literacy and adopt the roles of designer, manager, and facilitators.
2. **Students** while gaining the skills for updating their technological competency involve themselves laboriously in the process of learning and work as researchers.
3. **The computer** is a tool which is used for collecting, investigating, and presenting the finding of students' academic work rather than of what they learn about this machine.
4. **The lessons** are genuine in originality and problems based and are reliant on the engagement with computers.
5. **The classroom environment** encompasses the features such as access to various resources, the concurrent occurrence of several and different activities, and teamwork among learners.

The NTeQ Philosophy of Technology Integration

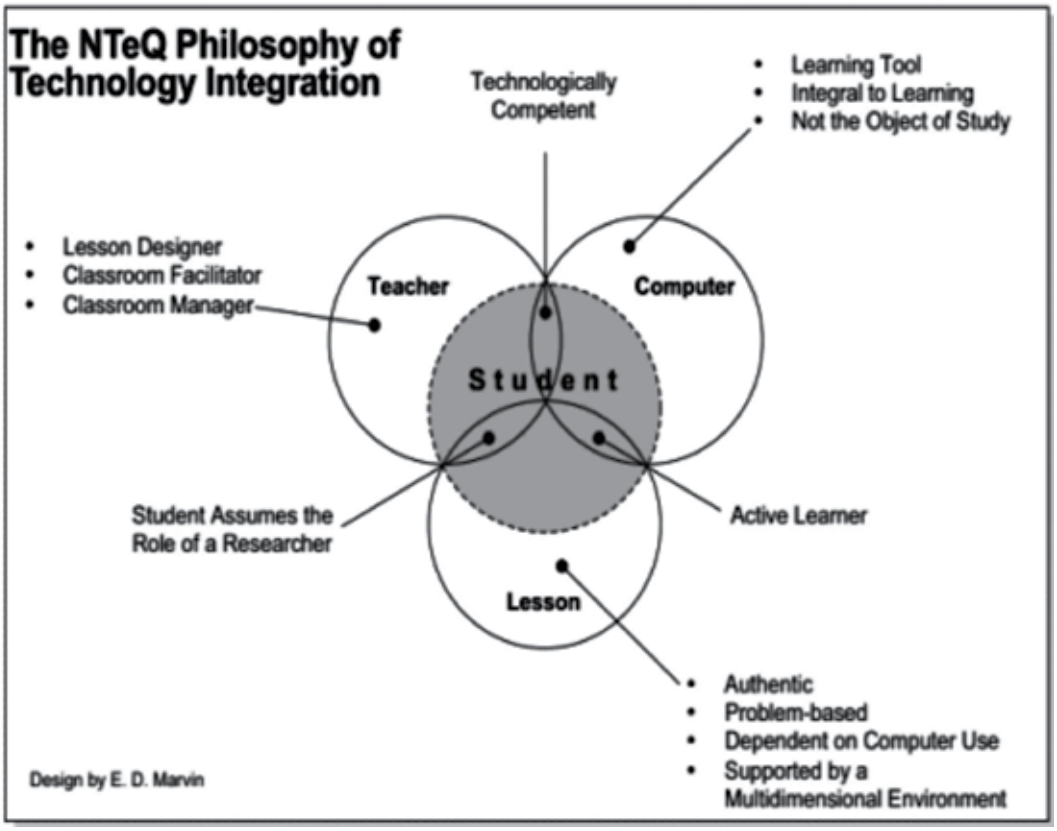


Figure 1 Source: *http://edit.educ.ttu.edu/site/jcheon/tth/DOC/Section4_TTH.pdf*

2.1.4 Difference between NTeQ Model and Traditional Classroom

Points of Difference	NTeQ Model	Traditional Classroom
1) Teacher	i. Teacher is technologically efficient and competent too. ii. Teacher functions as a designer, facilitator, and manager. iii. Make efforts in classroom management to facilitate multi-dimensional learning environment.	i. Technology competency is not an essential criterion for a teacher to accomplish teaching-learning process. ii. Teacher functions as a planner, instructor, and expert. iii. Design and organize classroom by using conventional resources available.
2) Environment	i. It provides student-centered environment. ii. A student can work in a team by using multiple resources to perform multiple activities.	i. Teacher centered environment. ii. Teacher manages discipline, instruct, inform students to accomplish task by using conventional resources.
3) Computer	It does not function as a tool . It functions with student's abilities for meaningful learning.	It is used as a tool and/or add on to curriculum.
4) Lesson	i. It is a problem based, inquiry based, and project based. ii. It focuses on authentic, genuine, and real problem which actively engages students.	i. It is designed, developed, and implemented without modification. ii. Students passively engaged as they are led through a lesson.
5) Student	i. Student is a active learner who engages in learning process to gain knowledge. ii. Technology competent. iii. Motivated towards collaborative learning.	i. Student is a passive learner to attain knowledge. ii. Lack of technology competency. iii. Focus on individual learning.
6) Content	Learner is a decision maker for deciding content and method.	Both content and teaching method decided by the teacher.
7) Resources	It encompasses on use multiple resources, concurrent occurrence of multiple activities.	It is dependent on teachers and text books.

2.1.5 Significance of NTeQ Model

1. It helps in enriching the technological competency of students.
2. It leads to higher-order thinking process.
3. It deals with collaborative work skills.
4. It establishes practice for authentic use of technology for problem based lessons.
5. Teachers will understand the relationship among basic computer functions, its application and student learning.
6. By analysing computer function and its application a teacher can use it to manage, retrieve, and manipulate data.
7. As computer is designed to develop a lesson it facilitates more time for discovery and research.

2.1.6 Professional Development for NTeQ Model

According to Durham, Morrison, & Ross, 1995,

"To use the technology provided in the school effectively, teacher professional development is indispensable. Teachers should regularly engage in professional development workshops and seminars focused on understanding the history of computers and computer terminology. Exactly how to use common software and peripherals should be learned by teachers to enrich their existing knowledge. It is considered that if teachers learn basic computer literacy skills, they will be efficient in incorporating computers into their curriculum. Yet, teachers who accept this type of basic training often have a choice for occasional working with computers or using computers for drill and practice or benefit students with good behaviour."

As per Lowther, Bassoppo-Moyo, Morrison, 1998,

"To successfully implement the NTeQ model by the teachers and the training for technological competency should be conducted. They need to engage themselves in activities for professional development that take them beyond the accomplishment of basic computer literacy skills."

2.1.7 The Technology Integration Matrix

The Technology Integration Matrix
Table of Summary Descriptors

The Technology Integration Matrix (TIM) provides a framework for describing and targeting the use of technology to enhance learning. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, collaborative, constructive, authentic, and goal-directed. These characteristics are associated with five levels of technology integration: entry, adoption, adaptation, infusion, and transformation. Together, the five characteristics of meaningful learning environments and five levels of technology integration create a matrix of 25 cells, as illustrated below.

→ LEVELS OF TECHNOLOGY INTEGRATION ↓ CHARACTERISTICS OF THE LEARNING ENVIRONMENT	**ENTRY LEVEL** The teacher begins to use technology tools to deliver curriculum content to students.	**ADOPTION LEVEL** The teacher directs students in the conventional and procedural use of technology tools.	**ADAPTATION LEVEL** The teacher facilitates the students' exploration and independent use of technology tools.	**INFUSION LEVEL** The teacher provides the learning context and the students choose the technology tools.	**TRANSFORMATION LEVEL** The teacher encourages the innovative use of technology tools to facilitate higher-order learning activities that may not be possible without the use of technology.
ACTIVE LEARNING Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.	**Active Entry** Information passively received	**Active Adoption** Conventional, procedural use of tools	**Active Adaptation** Conventional independent use of tools; some student choice and exploration	**Active Infusion** Choice of tools and regular, self-directed use	**Active Transformation** Extensive and unconventional use of tools
COLLABORATIVE LEARNING Students use technology tools to collaborate with others rather than working individually at all times.	**Collaborative Entry** Individual student use of technology tools	**Collaborative Adoption** Collaborative use of tools in conventional ways	**Collaborative Adaptation** Collaborative use of tools; some student choice and exploration	**Collaborative Infusion** Choice of tools and regular use for collaboration	**Collaborative Transformation** Collaboration with peers, outside experts, and others in ways that may not be possible without technology
CONSTRUCTIVE LEARNING Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.	**Constructive Entry** Information delivered to students	**Constructive Adoption** Guided, conventional use for building knowledge	**Constructive Adaptation** Independent use for building knowledge; some student choice and exploration	**Constructive Infusion** Choice and regular use for building knowledge	**Constructive Transformation** Extensive and unconventional use of technology tools to build knowledge
AUTHENTIC LEARNING Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.	**Authentic Entry** Technology use unrelated to the world outside of the instructional setting	**Authentic Adoption** Guided use in activities with some meaningful context	**Authentic Adaptation** Independent use in activities connected to students' lives; some student choice and exploration	**Authentic Infusion** Choice of tools and regular use in meaningful activities	**Authentic Transformation** Innovative use for higher-order learning activities connected to the world beyond the instructional setting
GOAL-DIRECTED LEARNING Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.	**Goal-Directed Entry** Directions given; step-by-step task monitoring	**Goal-Directed Adoption** Conventional and procedural use of tools to plan or monitor	**Goal-Directed Adaptation** Purposeful use of tools to plan and monitor; some student choice and exploration	**Goal-Directed Infusion** Flexible and seamless use of tools to plan and monitor	**Goal-Directed Transformation** Extensive and higher-order use of tools to plan and monitor

Figure 2 Source: https://fcit.usf.edu/matrix/matrix/

Entry Level Descriptors			
Active Learning deals with *Information passively received*	Information received by students through teacher or subsituted sources. By visiting websites for watching an educational video or spending time on a computer program for "drill and practice"	The only one i.e the teacher is actively using technology to support the delivery of a lecture. The inclusion of presentation software is possible. The teacher may too have the students to complete assigned tasks on computers by practising fundamental skills, such typing. "drill and practice"	The venue is arranged for direct teaching and individual work. Access of any technology resources to student is restricted and highly planned.
Collaborative Learning means *using technology tools by an individual student*	While using technology, students primarily work individually and also may have teamwork without using technology tools.	Students under the direction of the teacher work individually on technology based tasks .	The setting is organized for individual work with direct instruction
Constructive Learning stands for *Information delivered to students*	Students via technology receive information delivered by the teacher	The teacher uses technology to convey information to students.	The setting permits the teacher presentation of content to all students.
Authentic Learning dealt with *Technology use which is related to the instructional/ educational setting and not the world outside of the instructional setting*	Students engage themselves with technology to accomplish activities assigned to them, that are usually not related to the world beyond the educational/ instructional setting.	The teacher disperses educational task based on a designed and decided curriculum distinct for the students or concerns beyond the educational setting.	Available resources which are selected by the teacher, are possibly textbook or something textbook-like sources, in digital or/ as well as print. They are usually used without making influences to a context of real-world or to the individual lives of students.
Goal-Directed Learning focus on *Given directions as well as; step-by-step monitoring of tasks.*	Students may obtain directions, guidance, and/or response via technology.	The teacher gives students guidelines and monitors step-by-step achievement of tasks. The teacher sets objectives for students and monitors their improvement.	Technology tools may be included in the setting for the students to establish skill progress and allow tracking of student advancement across levels.

Adoption Level Descriptors			
Active Learning focuses on *using tools in a Conventional, procedural*	Students engage themselves with technology in conventional ways with directions issued by the teacher	The teacher makes the choice between which type of technology to be used and how to use it. The students are facilitated by the teachers through a designed project, making certain that each student accomplishes every step in the similar sequence with the similar tool. The teacher strongly controls the activities of these students even when they are more active than those students who are at the previous level or Entry level with respect to use of technology.	The students have restricted and controlled access to the technology resources as the setting is designed for direct instruction and individual work.
Collaborative Learning means *In conventional ways using tools Collaboratively*	Students have chances to use collective tools, such as email, in conventional ways. These chances for teamwork with others through technology, or in using technology, are restricted and are not a fixed part of their learning.	Using technology tools in the conventional procedure while working with others the teacher guides students.	The setting permits for the opportunity of group work, and at least some combined technology tools are available.
Constructive Learning is a *Building knowledge by guided and conventional use*	With prior knowledge Students initiate applying technology tools to construct and create meaning.	To build understanding and experience for using technology in conventional ways the teacher provides some chances for students. Students create meaning about the relationships between their prior understanding and new learning, however the teacher makes the choices /selections regarding use of technology.	For constructing knowledge among students that allows conventionally using technological tools are available on a restricted basis.

Authentic Learning emphasizes on *using guided activities with some meaningful context*	Students provided with occasions to relate technology tools with some content-specific successful achievement that are connected to the students or concerns delimited to the instructional setting.	The teacher provides guidance for learning activities conventionally using technology tools that are occasionally connected to the students or to concerns delimited to the instructional setting.	Available resources, preferred by the teacher, which may be predominately digital or print school book or textbook sources, and students may be allowed to have directed access to prime material source and selected informative facts, data, and source tools beyond the educational/ instructional setting.
Goal-Directed Learning leads to *to plan and/ or monitor the Conventional use of tools and its procedure*	Students follow technical directions for using technology conventionally to set objectives, plan, observe, evaluate, or reveal upon an activity.	The teacher provides guidance to the students for procedural and conventionally used technology tools to establish goals, plan, and observe, evaluate an activity, or reveal upon learning activities.	The setting comprises access to some teacher-selected technology tools that permit students to establish goals, design, monitor, evaluate, or reveal upon their work.

Infusion Level Descriptors			
Active Learning focuses on *self-directed regular use of tools with choice of these tools*	Students comprehend how to use multiple categories of technological tools and are able to make choice between tools for precise purposes, and make use them repeatedly.	Selection of technology tools by students is guided by the teacher with information and contextualization by considering flexibility and openness to student ideas. Structured lessons that are provided to the students, so that they use technology in a self-directed manner.	Multiple technological tools are accessible to meet the necessities of all students.

Collaborative Learning emphasizes *for collaboration choosing tools with their regular use*	Technology use for teamwork by students is consistent and regular in this setting. Students select the finest tools to use to undertake their work.	The teacher fosters a collective learning environment and supports students expressive selections in their choosing technology tools for their teamwork.	Technology tools that permit teamwork are constantly available to match the necessities of all students.
Constructive Learning leads to *Choosing technological tools with regular use for building knowledge*	Students constantly have chances to select technology tools and practice them in the way that finest simplifies their construction of considerate.	The teacher constantly permits students for selection of technological tools to practice in structure an considerate of a concept. A framework is offered by the teacher in which technology tools are effortlessly integrated into a lesson, and is an understanding of student self-sufficiency in selecting the tools and when they can best be used to achieve the anticipated outcomes.	The setting comprises a diverse range of technological tools and their access to rich online resources to come across the requirements of all students.
Authentic Learning directed towards *in meaningful activities by making a choice of tools with their regular use.*	Students make choice for suitable technology tools for comprehensive activities that have a significant framework not limited to the instructional/ Educational setting. Students repeatedly practice technological tools, and are competent in selecting and using the tools in the distinguished important way for each activity.	The teacher inspires students for using technology tools to make associates to the world external of the educational setting, and to their lives and benefits. The teacher offers a learning framework in which students repeatedly use technology tools and have the choice to select the tools that, for every student, best match the assignment.	The setting delivers a diverse range of technological tools and continuing, autonomous access for making broad choice of available information, data, and source materials which is not restricted to the educational. setting. This access simplifies student search of distinct welfare and evolving topics.

Goal-Directed Learning guides *use of tools with flexibility and seamless for planning and monitoring*	Students repeatedly use technology self-reliantly to set objectives, plan activities, monitor improvement, evaluate results, and reveal upon learning activities. The students may select from a diversity of technologies when functioning on self-directed aims.	The teacher constructs a learning framework in which students repeatedly use technology tools for establishing aims, to plan, to monitor, to evaluate outcomes, and reveal educational learning activities. The teacher simplifies students' select and self-regulating usage of technology tools for achievement of these tasks.	The setting comprises a rich and wide range of technology tools which permits students for many selections in how they set objectives, plan, monitor, evaluate, and reveal upon their work.

Transformation Level Descriptors			
Active Learning aims at *use of tools for Extensive and unconventional learning*	Students have access for making choices on how and why to use diverse technological tools for higher-order thoughtful tasks. They often use these technological tools in unique forms and the technology itself becomes an indispensable part of the learning.	The teacher helps as a guide, supporter, and portrays self as a model in practicing with technology. The teacher reassures and supports the vigorous commitment of students for using technology resources. In higher-order learning actions the teacher simplifies lessons. The students are involved that may not have been potential without the use of technological tools. To support student choices the teacher locates suitable resources so that students are benefitted.	The preparation of the setting is flexible and diverse, allowing diverse kinds of self-directed learning activities supported by several technologies, including vigorous online resources access for all students instantaneously.

Collaborative Learning focus on *Collaboration by the means of technology with peers, outside experts, and others. in such a ways that may not be possible without engagement of technology*	Students with peers use technology tools repeatedly to work together with peers, specialists, and those who may be in diverse locations and may signify different involvements, cultures, and their points of view.	For higher-order learning activities students are allowed to access specialists and peers in other locations, by their teacher for seeking partnership outside the setting inspires students to encompass the use of collective technological tools that may not be promising without using technological tools.	Technological tools in this setting attach to text, voice, and video applications and web access has adequate bandwidth to support for using these technologies for all students instantaneously.
Constructive Learning encourages *to build knowledge, extensive and unconventional use of technological tools*	For building and sharing knowledge students use technology means probably without using technology that may not be possible.. Their profound consideration towards technological tools permits them to encompass the use of these tools in inspired ways to create meaning.	The teacher simplifies higher-order learning occasions in which students engage regularly in various activities that are essential and may be impossible to accomplish without using of technological tools. For exploring the utilization of technology in unconventional ways and to use them in their full capacity encouragment is initiated by teacher towards students for using variety of multiple tools in order to construct knowledge.	The setting includes vigorous access to a varied diversity of technology tools, vigorous access to resources available online and groups, and the capability to publish innovative content online.

Authentic Learning emphasized on an *connection to the world for Innovative use for higher-order learning activities beyond the instructional / educational setting*	Students explore and encompass using technological tools to contribute learning activities which are in higher-order that have sense in the world far away the educational/ instructional setting. Students repeatedly involve themselves in those activities which may not be conceivable without using technology.	The teacher reassures pioneering using technological tools for higher-order learning activities that support networks to the lives of the students and the world far away the educational/ instructional setting.	The setting offers access for ongoing, self-regulating broad collection of available information, data, and source materials far away the educational/ instructional setting. With the Vigorous, instantaneous access to a diversity of technology tools permit all students to involve directly with others who may be located at different places and may signify different involvements, beliefs, points of view or opinions.
Goal-Directed Learning exercises *Using tools for planning and monitoring extensive and higher-order learning*	Students involve in continuing metacognitive accomplishments, and work on self-directed objectives, at a level only promising with the support of technology. Students are authorized using technology tools in expanded form and have improved possession and commitment for learning.	The teacher builds a rich learning surrounding in which students repeatedly involve in higher-order development, monitoring, evaluative, and insightful activities that may be tough to complete without technology. A framework set by the teacher in which students are stimulated for using technology tools in innovative ways to direct and disclose on their own learning.	The setting comprises vigorous access to a rich diversity of technological tools and online resources to permit students many choices in how they self-sufficiently set objectives, plan, observer, evaluate, and reveal upon their work.

2.1.7 Implementation of the NTeQ model

1. Teachers need to hear role-playing classroom settings as responsibility is taken by them for the activities of students and solve problems using the computer as a tool.
2. Teachers need to understand the basic functions of computer software and how these functions can be executed to improve the teaching-learning process.
3. Teachers need to combine their existing knowledge of how learners learn with new technologies in order to design, manage, and simplify a student-centered, multi-dimensional learning environment.

In some schools teachers have a lack of access to the proper hardware and software for their subject. Overcoming this difficulty is frustrating if the technology is not readily available to all teachers. A possible solution lies in the teacher exchange schedule and the required technical pieces. Students are too fast while picking up information when it is presented in a diversified way and the NTeQ model provides an effective way to use teacher education and technology. if a school or classroom has a sacrcity of computers for students.

2.1.8 NTeQ and the trainer

Educator role or trainer with the NTeQ technique is also more special than what's observed in conventional lecture room environments. Underlying this attitude is that teachers must end up, if they're not already, technologically equipped. Technological competence requires teachers to move past a simple expertise of PC capabilities to greater insightful, school room-applicable information,especially, because of this teachers need to:

1. reveal the computer utility as a learning tool.
2. apprehend how laptop capabilities can help pupil mastering.
3. follow their understanding of the era and getting to know how to design, control, and facilitate a multidimensional study room getting to know the environment.

In making ready for the teacher's role with the NTeQ technique, it is in particular critical for an instructor to gain revel in the usage of a laptop as a mastering tool. Teachers who have an expertise of the way PC capabilities (and software functions, in particular) can assist pupils gaining knowledge might be extra prepared to use generation successfully inside their classroom. Instead of using computers merely for the sake of using a PC, such instructors will start to use technology as a tool to facilitate scholar-centered studying. Ultimately, the NTeQ model asks teachers to become study room managers. In a control position, instructors oversee scholar rotation schedules, fairness of computer use, and similar supervisory troubles. In this role, teachers may additionally want to exercise their very own lesson plans to make sure that they're designed in a manner so as to enhance scholar studying of the specified goals.

2.2 Need, Relevance and Criteria for authenticating of ICT resources

2.2.1 Authentication

The authentication is a procedure that is always initiated at the start of the application. It is initiated prior to the permission and regulating checks occur. Begin with any other code which is permitted to proceed. The need of multiple credentials depends on Diverse systems to ascertain a user's identity. The credential is regulated in the form of a security code which can be a keyword or a password, is confidential and only the individual and the system have knowledge about these. Following are three categories under which someone may be authorized:

4. to identify or know,
5. identity of user, and
6. the user comprises of or has.

The procedure of Authentication has two distinct stages –

1. Identification or credential and
2. Actual or Genuine Authentication.

2.2.2 Identification and Authentication

Identification	Authentication
Identification stage provides a user's individuality to the security system. This uniqueness is provided in the form of a login ID or user ID. The security systems will explore objects in abstract form that it recognizes and find the exact which one the actual user is presently applying. After this , the user is identified. Nevertheless, the assertion of the user does not necessarily mean that this is true. A genuine user can be represented to other abstract user object in the system, and consequently be approved rights and authorizations to the user and user must give confirmation to prove his identity to the system.	The method of determining claimed user identity by scrutiny user-provided confirmation is called authentication. The evidence that is provided by the user through process of authentication is called a credential.

Need for authenticating of ICT resources

1. Discovery of Information
2. Retrieval of Evidence
3. Use of information : Collection, Investigation, and Representation
4. To monitor, track, and prevent the misappropriation of digital technologies for fakery and deception, privacy invasion, and the perpetuation of bias.
5. To maintain Digital integrity: such as noise patterns, pixels, and digital packaging constant or inconsistency.
6. For protection of Physical integrity : like the laws of physics violated in the image, such as shadow and lighting or various vanishing points.
7. To hold Semantic integrity in other sources, such as related images taken at the same time, challenge the evidence in the image under review.
8. For video piracy and enabling secure e-contracts, and
9. Protective integrity of healthcare data.

2.2.3 The factors of authentication

The ways in which someone may be authenticated fall into three categories, based on what are known as the factors of authentication: something you -know, have or are. These factors, and how they may be compromised

Factor Something you...	Examples	Attack method
Know	Common examples are passwords and collections of personal information (e.g. mother's maiden name). Personal information is not necessarily secret, but is assumed to be unknown by anyone else. NOTE — Mother's maiden name is now regarded as providing little confidence in the claimed identity.	An attacker must discover the known information.
Have	Signet rings and passports are examples. Such objects are collectively called tokens. Some tokens perform sophisticated authentication functions, such as providing protected storage for cryptographic keys and performing cryptographic operations. Tokens for electronic authentication come in software or hardware forms.	An attacker must obtain or copy the token.
Are	This is either a physical (as with fingerprints) or behavioural (as with typing patterns) characteristic of a person. Authentication methods based on this factor are commonly called biometrics.	An attacker must replicate what you are.

2.2.4 Relevance for authenticating of ICT resources

Authentication has various benefits as:

1. the formation of copyright deposit "collections of record",
2. certified deposits of original sources combined with a record certification services,
3. registering identifiers for unique document ,
4. publishing "key" data about documents should match that of the document in hand which, when hashed, or otherwise calculated in a publicly available way,and
5. to carry document authentication as well as for declarations or proofs there is need for defining metadata structures
6. user can decide whether or not a user is mandatory to enter a username and password
7. identified server validates any messages sent which Encrypts transactions over the network
8. to enable easy revocation by the centralized management of certificates the user identity validated using a trusted party (the Certificate Authority)
9. optional - for maintaining uniqueness user can configure the certificate to the device it is installed on so it cannot be exported to other devices,
10. restricted access by group of users, their roles, or device based on Active Directory
11. besides authentication such as integrity and confidentiality it serves multiple purposes.
12. besides phishing, keystroke logging and man-in-the-middle attacks it prevents malicious attacks including but not limited to only these problems,

2.2.5 Criteria for authenticating of ICT resources

1. Multi-factor authentication and security:
2. Single-factor authentication
3. Two-factor authentication
4. Three-factor authentication

5. Secret methods involve hiding data in the object to reveal its source. Techniques include: digital watermarking, Stegonography and digital signatures.
6. Review Technology Integration and Support, for example, authentication, access of data needs, and networking, etc.
7. Authenticated fitting with established university level IT initiatives, priorities and strategic direction
8. Enquiring Purchasing requirements, for example, agreement, licenses, sole source, and gift-in-kind, etc.
9. Evaluation of Software and operating systems, including online "cloud-hosted" applications and services, for example, subscription databases, licenses, subscriptions.
10. Assessment and analysing Web-based content, for example, websites, online surveys and other content, social media sites, online subscriptions, etc.
11. Verifying and confirming Telecommunication products, e.g., telephones, cell phones, smart phones, etc.
12. Scrutiny of Video and multimedia products and services, e.g., TV displays and tuners, projectors, media players and recorders, wearables, and mediated content such as DVDs, streaming media, etc.
13. Inspecting Self-contained, closed products, e.g., printers, scanners, copiers, kiosks, digital cameras, scientific instruments, etc.
14. Reviewing Hardware, for example, servers, Appliance associated with computers, mobile devices, storage, and peripherals, etc.

2.3 ICT-based Teaching-Learning approaches in schools

2.3.1. ICT-based teaching-learning approaches in schools

Information and Communications Technology (ICT) can influence student learning when teachers are digitally learnt and apprehend how to integrate it into curriculum.

Schools use a various set of ICT tools to communicate, create, circulate, store, and succeed information. In some contexts, ICT has also become essential to the teaching-learning interaction, through such approaches as replacing chalkboards with digital whiteboards, using students' own smartphones or other devices for teaching during class time, and the "flipped classroom" model where students view lectures at home on the computer and use schoolroom time for more collaborative trainings.

When instructors are digitally educated and talented to use ICT, these approaches can lead to

1. higher order academic skills,
2. deliver creative and individualized choices for students to direct their understandings, and
3. students equipped to deal with ongoing technical change in people and the workroom.

ICT concerns planners must contemplate include:

1. considering the entire cost-benefit equation,
2. giving and maintaining the mandatory infrastructure,
3. confirming investments are matched with teacher provision and
4. other policies targeted at effective ICT use.

Integration of ICT in teaching and learning

1. Schools should attempt to provide all their students with suitable and justifiable level of experience of ICT at all class levels.
2. Continuous efforts should be made in schools to enhance the level of teachers' access to ICT equipment.
3. The establishment of internet access in classrooms and access to a school network should be a importance for schools. The relevant DES contributions will help assist this provision.
4. Teachers should regularly analyse their use of ICT with a view to escalating their repertoire of teaching approaches, including occasions for students' engagement with the technology.
5. Schools and teachers should make better use of ICT to distinguish the execution of the curriculum within the conventional classroom.
6. Teachers should fully exploit the possibility of ICT to simplify the development of students' knowledge and accomplishment skills.
7. Teachers should exploit the prospective of ICT to develop a variety of skills in students, including research and collaborative skills, creative writing skills, communication skills, and the higher-order skills of analysis, evaluation, and problem-solving.

2.3.2. The impact of ICT on teaching and learning

When used effectively, ICT contributed to teaching and learning in varying ways. ICT can influence teaching and learning in following ways:-

1. using ICT means that information can be obtained almost instantly. The worldwide web, for example, contains a vast amount of easily accessible information. Such evidence can provide students with different viewpoints and a wider understanding of issues
2. ICT helps teachers to modify teaching materials to suit the requirements and ability levels of their students
3. ICT acts as an encouragement for students to learn. The technology can be active in engaging them in their schoolwork
4. ICT helps make learning more stimulating. It increases levels of interest, for example with colour, animation, and sound. It also assists multi-sensory learning through, for example, multimedia demonstrations, animation, and video
5. ICT helps students to exertion at their own pace and level. Some programs, for example, have "smart" tracking systems that adjust the pace of learning.
6. ICT subsidizes to the progress of a personalised or step-by-step learning scheme. It provides occasions for students to learn in diverse ways
7. Some programs confirm students' efforts, and this can inspire them in their learning. This facility also offers them with timely advice on their work and offers them with a consideration of their development.
8. ICT facilitates student-centred learning and can inspire students to take obligation for their own learning. Some softwares individually identify students' problem areas for extra strengthening. ICT encourages self-directed learning.
9. Effective use of ICT, especially in distinct, pair and group work with computers, can lead to better-quality classroom discipline and improved management of learning.

2.3.3. Types of Technology based Learning Environment

1. **M-learning:** M-learning is the term given to the delivery of training by means of mobile devices such as mobile phones, PDA's (Personal Digital Assistants) and digital audio players, as well as digital cameras and voice recorders, pen scanners etc.
2. **E-Learning:** E-learning is an approach to learning and development: a collection of tools and techniques utilizing digital technologies, which enable, distribute and enhance learning
3. **Teleconferencing:** Audio, Video, Computer and Desktop: A particularly effective teleconference technique is to have a local activity at each site that prepares participants for the broadcast event. There are different types of teleconferencing audio, video, and computer conferencing including desktop videoconferencing, but they all provide some form of two-way interaction.
4. **Interactive Multimedia:** Expanding Computer-Based Training: Interactive multimedia implies two important capabilities:

- To be able to present information in multiple modalities and
- To allow the user to control the interaction to varying degrees depending on the nature of the program.

5. **Web-Based Training (WBT):** The WBT uses web-based technologies for the purpose of training.

2.3.4. Paradigm shift in both content and Pedagogy: Designs for teaching –Learning in Schools

Active learning
ICT-enhanced learning promotes increased learner engagement. ICT-enhanced learning is also -just-in-time learning in which learners can choose what to learn when they need to learn it. ICT-enhanced learning mobilizes tools for examination, calculation and analysis of information, thus providing a platform for student inquiry, analysis and construction of new information.

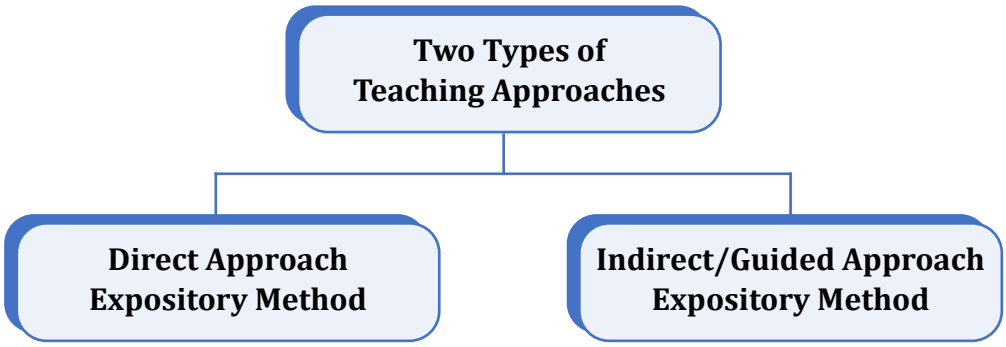
Collaborative learning
It models learning done throughout the learner's lifetime by expanding the learning space to include not just peers but also mentors and experts from different fields. ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are.

Creative Learning
ICT-supported learning promotes the manipulation of existing information and the creation of real-world products rather than the regurgitation of received information.

Integrative learning
This approach eliminates the artificial separation between the different disciplines and between theory and practice that characterizes the traditional classroom approach

Evaluative learning
ICT-enhanced learning is student-directed and diagnostic

2.3.5. Classification of Teaching Approaches



Directive	Inductive
Deductive	Exploratory
Demonstrative	Reflective
	Constructivism
	Problem Solving
	Inquiry
	Meta Cognition
	Laboratory

2.3.6. ICT Based Teaching are Learning Approaches

ICT Based teaching approaches are divided into four categories based on two main parameters: a teacher-centered approach versus a student-centered approach, and high-tech devices/material use versus low-tech devices/material use.

1. **Teacher Centered Approach :** Under this approach
   - A teacher gives direct instructions to students
   - Acts as formal authority
   - Takes place of expert
   - Develops personal model
2. **Student Centered Approach :** Under this approach
   - Inquiry Based learning takes place
   - Students are facilitated by Cooperative learning
   - Students develop their own model for learning
   - They act as delegator
3. **Hi-Tech Devices/material Approach :** Under this approach teachers and students utilize different technology to aid the students to learn in their classroom learning process respectively.
4. **Low-Tech Devices/material Approach :** The approach/ method that has requirement of physical presence and interaction between the teacher and the learner.

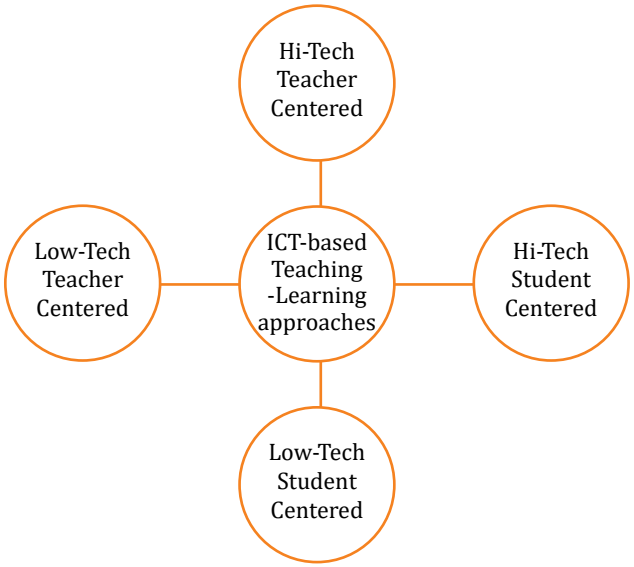
Examples

Hi-Tech Teacher Centered Approach: Flipped Classroom

Hi-Tech Student Centered Approach: Personalized learning, Game-based Learning, and Inquiry based learning

Low-Tech Teacher Centered Approach: Direct Instructions, Kinesthetic learning

Low-Tech Student Centered Approach: Differentiated Instructions, Expeditionary Learning



2.3.7. Teacher-Student Centered Teaching-learning Approaches

Teacher-Student Centered teaching–learning approaches from left to right moves as paradigm shift.

1. **Lecture/telling/Showing method:** In this method the teacher
   - Develops a model that interacts with the subject.
   - Determines an approach to complete a task, or shows an example to provide solutions to problems.
   - By providing opportunities to the student, encourages for guided practice often assigning small group work in class with an emphasis on constructive feedback, and
   - Assigns individualized practice with an objective on mastery learning.
2. **Worked Examples:** In this method step-by-step demonstration is provided to the students. The process to completing a task or accomplish objective is shown. The philosophy of simple to complex procedures takes place. Therefore, first introduce in their simplest form, then the teacher progressively evolves towards difficult one. Worked examples are the means of imparting information. Therefore, this process is also considered as a form of lecturing.
3. **Interactive Lectures :** Some of the educators develop their lectures in such a way that their students, individually or in groups of few students answer using various forms of material, devices, or apps such as colored flashcards or polling technologies. These include apps such as clickers or BYOD apps.
4. **Flipped Classrooms :** Students in this type of learning attend the class for the guided practice. In such classrooms the students initially engage themselves with online content (by the means of readings, video lectures, or podcasts).

5. **Socratic Questioning :** Socratic questioning method of learning involves the teacher's assistance of critical thinking in learner by dint of wisely developed questions.

   R. W. Paul has suggested six categories of Socratic questions:

   - for clarification,
   - that probe assumptions,
   - that probe evidence and reasoning,
   - about viewpoints and perspectives,
   - that probe implications and consequences, and
   - about the question.

6. **Discussion Based :** A method in which students benefits with meaningful transition that leads to the extended conversation in each academic discipline. Discussions allow learner to exercise applying their existing learning and developing their critical-high order thinking skills in real-time communications with other viewpoints.
7. **Scenario Based :** It focuses on real-life situations. It is a validated learning that triggers, and emphasizes to drive behavioural change. It helps in decision-making, and leads to critical thinking skills. It facilitates learner with problem –solving.
8. **Case-Based :** Case-based learning method is used broadly across many disciplines. Collections of validated case studies are available online, and offline often available with hand-outs, readings, assessments, and guidelines for the teacher.
9. **Collaborative Learning :** Learning in small group of students is a common practice across all levels of education. Common classroom activities selected by students for collaborative learning are "think-pair-share," project-based learning, fishbowl debates, case studies, problem-solving, jigsaw.
10. **Inquiry Based :** Inquiry-based learning comprises a range of question-driven styles that seek to increase students' self-directed development for critical-thinking and problem-solving skills.
11. **Problem Based :** The teacher is to design and develop an ill-structured problem for the learner and a schedule for submission provided simultaneously.
12. **Project Based :** Project-based learning is similar to problem-based learning; however, the student comes up with the problem or question to research. Often, the project has to be submit is a creative product, which can increase student commitment for its completion and long-term learning.

The above methods begins with Exposition and through Inquisition lead to Generalization

2.3.8. Key Teaching Techniques based on Modern and ICT Based Teaching Methods

1. **Flipped Classrooms:** It permits leaner to go beyond their conventional learning practices and limitations. They get opportunity to explore the lesson prior to teacher explaining the lesson in the classroom.
2. **Design thinking and creative ideas:** It emphasizes on real life scenario that leads to inquisitiveness, diagnostic skill, and creativity.
3. **Mind Maps:** This helps in learning by using self- learning tools. These tools include Bubbl.us, iMindMap, MapMyself, MindManager, MindMaper, MindMiester, Popplet, Cmap, FreeMind, WiseMapping, Xmind

4. **Gamification:** When learning takes place with the help of games, quizzes and hunt ideas. For example these tools include Quizlet, ClassMarker, Hot Potatoes, MyGradeBook, Online Exam Builder, Respondus, Test maker,Easy Test Maker, Exam Buddy.
5. **Free online learning tools:** Axonify, aNewspring, Blackboard, Canvas, Curatr, D2L, Degreed, Edmodo, Google Calssroom, Mahara, me:time, Moodle, PebblePad, Schoology, Thinkific, Totara Learn
6. **ICT based teaching methods:** These are classified under the heading of Hi-Tech and Low-Tech ICT based teaching methods. These methods are further classified as teacher centered and student centered ICT based teaching method.
7. **Learning management system and Massive open online courses:** It includes free online learning tools as well as (tools mention above).

Key Teaching Techniques based on Modern and ICT Based Teaching Methods
Flipped Classrooms
Design thinking and Creative Ideas
Mind Maps
Gamification
Free online Learning Tools
ICT Based Teaching Methods
Learning Management system and Massive Open online courses

2.3.9. Highlighting integration of ICT for enhancing teaching learning approach

Digital culture and digital literacy -the abilities of searching for, discriminating, and producing information, as well as the critical practice of new media for full contribution in society—has thus become an imperative consideration for curriculum context. Some common educational applications of ICT comprise:

1. **One laptop per child:** Less costly laptops have been aimed for use in school on a 1:1 basis with features like lower power intake, a low cost functioning system, and special re-programming and web network functions. Despite efforts to shrink costs, nevertheless, providing one laptop per child may be too expensive for some developing countries.
2. **Tablets:** small personal computers with a touch screen are Tablets, permitting input without a keyboard or mouse. Low-priced learning software ("apps") can be transferred onto tablets, making them a multipurpose tool for learning. The most effective apps progress higher order thinking skills and provide creative and customised options for students to express their considerations.
3. **Interactive White Boards or Smart Boards:** It permits projected computer images to be displayed, influenced, dragged, clicked, or copied. Concurrently, handwritten notes can be taken on the board and kept for later use. Interactive white boards are linked with whole-class education rather than student-centred activities. Student commitment is usually higher when ICT is accessible for student use throughout the classroom.

4. **E-readers:** It is an electronic devices that can hold hundreds of books in digital form, and they are progressively applied in the delivery of reading factual. Students—both expert readers and reluctant readers—have had affirmative responses to the use of e-readers for self-determining reading. Features of e-readers that can contribute to affirmative use comprise their portability and long battery life, reaction to text, and the capacity to define unknown words
5. **Flipped Classrooms:** The flipped classroom model, connecting lecture and home-based practice via computer-guided tutoring and interactive learning activities in class, can permit for an extended curriculum. There is little enquiry on the student learning conclusions of flipped classrooms. Student insights about flipped classrooms are mixed, but usually positive, as they choose the cooperative learning activities in class over lecture.

2.3.10. Advantages of ICT enabled tools for teaching-learning Process

1. By the means of ICT, images can simply be shown in teaching to progress the retentive memory of students.
2. By means of ICT, teachers can simply explain difficult instructions and confirm students understanding.
3. ICT helps teachers to create interactive classes and make the lessons more gratifying, which could upgrade student attendance and concentration.
4. Teachers will contribute in selection and critical assessment of digital content and resources. They will also be encouraged to progress their own digital resources, allocation of them with colleagues through the digital repositories.
5. In schools prepared with EDUSAT workstations, DTH or other broadcasting devices, applicable activities will be planned and merged into the time schedule of the school.
6. It gives access to learning materials created by their teachers and others, outside lesson time and from places such as their local library or home
7. It helps in storage of their work and notes on line for use in projects, homework and revision, outside normal school hours
8. Students can work at their own speed and with a extensive choice of learning styles, through a more modified curriculum
9. It helps in creating an on-line portfolio, comprising digital photographs and videos of presentation, as well as text
10. It advances their ICT skills and on-line controlling of materials
11. Students can submit homework and projects for marking and assessment
12. Communication takes place by e-mail and participation in live discussions and forums with other students and with teachers.

2.3.11. Teacher Professional Development

According to Lowther, Bassoppo-Moyo, Morrison, 1998

For successfully implementation of the NTeQ model teachers need to contribute in professional development activities that take them beyond the accomplishment of basic computer literacy skills to a level of technical competence.

According to Morrison, Lowther, DeMeulle, & Abraham, 1998

These professional development activities are prerequisite to include the following elements.Teachers need to practice simulated classroom settings where they accept the role of students and solve problems by using the computer as a tool.

1. Teachers need to advantage an understanding of the fundamental functions of computer software and how these functions can be used to improve the learning process.
2. Teachers prerequisite to combine their existing knowledge of how students learn with new knowledge about technology to design, manage, and enable a student-centered, multidimensional learning setting.
3. Teachers need to practice simulated classroom settings.

2.4 Educational Radio and TV, Mobile Learning, Teleconferencing/ Video Conferencing

The National Education Policy (2020) mentions technology integration is needed

"to support teacher preparation and development; improve teaching, learning and evaluation processes; enhance educational access to disadvantaged groups; and streamline educational planning, administration and management". Consequently, technology incorporation has implications involving various aspects of teaching-learning.

2.4.1. Radio

2.4.1.1. Audio-based teaching for teacher education includes

1. radio transmissions;
2. Interactive Radio Instruction (IRI);
3. one- and two-way audio instruction; and,
4. progressively, podcasts.

2.4.1.2. *Radio broadcasts* have been focused mainly at teachers.

1. Content is developed for teachers, and official teacher learning occurs outside the classroom.
2. In Comparison, the primary audience for IRI and two-way radio has been learners, with teachers as a secondary spectators (if at all).
3. Content is designed and developed for students, and the primary locus of learning is the classroom.
4. Nevertheless, research on IRI in particular has confirmed that teachers as well as students have assistance significantly from classroom-based audio instruction.

5. Audio instruction has verified to be a successful means of transmission information to teachers, predominantly in areas of conflict, areas marked by difficult terrain, and remote and inaccessible locations.
6. Because it is a transmission technology, new spectators can be brought on board at very low unit expenses.

2.4.2. Television

1. Television, has for eras been well recognized as an education mode on condition that high-quality content and instructional techniques for prospective, in-service, and on-going teacher education.
2. Teachers have contributed in television-based professional development in their homes; in their schoolrooms; or, in zones where television is not extensively accessible, in broadcasting centers.

2.4.3. Internet Protocol Television (IPTV)

1. As televisions link to the Internet directly or from end to end set-top boxes, Blu-ray players, and game supports.
2. There are possibilities of an explosion of contributions and formats that, though geared just before clients in the short term, will certainly influence television as a learning approach in the medium and long term.
3. Apple and Google during 2010 launched Apple TV and Google TV32 respectively.
4. Google TV is a software platform that permits users to download Internet videos as well as cable television programs and merge them all in the same place.

2.4.4. Phones and Audio Conferencing

Phone-based audio conferencing permits multiple parties of instructors to connect using either an audio-conferencing bridge system or peripheral conferencing providers.

Audio conferencing has substantial benefits:

1. it is synchronous,
2. permitting instructors to interconnect in real time; and
3. it is simpler to use than other distance education media such as video conferencing.
4. Phones/Headsets are a familiar intermediate requiring no or partial training.
5. The Internet and mobile technologies are renovating all systems of audio-based learning.
6. Podcasts have become a progressively common and beneficial tool in the audio-based teacher professional growth repertoire because of their adaptability and portability.
7. Instructors can listen to them on MP3 players, such as the smart phone, such as the iPhone or Blackberry; iPod; (PDAs)personal digital devices, such as the iPod Touch; and through the Internet.
8. Abundant support services are being established to support audio-based learning. For example, Google Listen permits users to do voice explorations for audio files and to contribute, download, and stream these files onto Android-enabled cell/ headsets to create adapted “audio magazines.”

Audio conferencing has improved in acceptance because of the Internet

1. Free Web-based audio-conferencing programs permit consumers to communicate orally at no charge from computer to computer using a phone/ headset, from computer to phone with the help of unrestricted Internet telephony applications such as Skype, or from phone to handset using free audio conferencing such as Conference Up.

2. Other unrestricted phone-conferencing tools such as Google Voice Rondee and Group Me, combine text- and voice-based services.
3. Wiggio is another unrestricted group management facility that allows conference calling and helps consumers plan ventures, send mass text messages, and take surveys within groups.
4. It also permits users to reorganize voice and e-mail communication; set up simulated meetings; and combine screen share, a shared whiteboard, file interchange, and videoconferencing options with a conference call—features that create it a possibly powerful teacher learning tool.

2.4.5. Mobile Technologies for Teaching- Learning

1. M- or u-learning basically includes e-learning through small, mobile networked devices-cell phones, smart headsets, personal digital assistants (PDAs), tablets, and handy media players-so that learners can access material, classmates, and resources universally.
2. Mobile technologies have delivered a substituted way to involve teachers and learners in the teaching and learning process.
3. For the furthermost part, these devices are cheaper, more convenient, and easier to use and sustain than desktop or laptop computers.
4. Numerous initiatives-several in developed countries-have used cell phones to strengthen language learning and mathematics, conduct homework projects, and deliver Internet access. For example, instructors have sent homework projects to students via SMS or multimedia message services (MMS).
5. In terms of additional mobile technologies, students have used PDAs to conduct Internet investigation. Portable media players have also been used to encourage language acquisition, with students listening to and working along with recordings of language- instruction sessions.

2.4.6. Video

1. Videos used to be challenging to find but is progressively easy to access and develop.
2. Videos of classroom Proceses can be attained from many universities and private companies, frequently through Internet download.
3. Videos are designed to accomplish specific objectives in specific frameworks, however, and may not be suitable for use in all frameworks. Examples of instruction videos can be easily accessed, downloaded, and stored on DVDs using any number of free tools through YouTube, in addition to in-country repositories of video.
4. Through the occurrence of increased Internet bandwidth, low-cost but impartially vigorous pocket video recorders, and online facilities to compress and stream video, consumers can construct their own streaming cinematic for usage on computers, phones, and tablets. For example, a face-to-face professional expansion session or lecture at an educator training college can be recorded live and streamed live (through a free Internet video service such as UStream).
5. Likewise, users can record video by means of a pocket video recorder or video-enabled cell phone and practice the progressively easy video editing tools that come with portable recorders or with a PC (MovieMaker) or Mac (iMovie) to produce their own teaching videos.
6. These videos can be made interactive by introducing a slide/still of discussion questions or group activity projects, which can then be probable on a wall using a mini-projector such as the Pico or Acer's micro-projector.

2.4.7. Videoconferencing

1. Videoconferencing also referred as to video-teleconferencing, is a set of interactive technologies that permit individuals in two or more sites to interact via full-motion, two-way video, and audio broadcasts simultaneously.
2. Videoconferencing can take place via high-end dedicated systems (which can be supportive and remote control video cameras).
3. It uses multiple video cameras with high-definition screens.
4. It can also use low-end Internet-based desktop systems, such as Team Viewer or Skype, in which members can interconnect via a built-in or external computer Web camera.
5. In simple words, it is two-way, real-time broadcast of audio and video signals between dedicated devices or computers at two or more sites via satellite (wireless) over a network such as a local area network or the Internet.

2.4.8. ICT-Based Education Models

ICT Based Education Models	Examples
Correspondence model	➢ Print
Audio-based models	➢ Broadcast: IRI and Broadcast radio ➢ Narrowcast: IAI (via audio tape or CDs) and Two-way radio ➢ Audio conferencing and telephone
Televisual models	➢ Broadcast television (educational and instructional) ➢ Videoconferencing and Video
Computer-based multimedia models	➢ Interactive video (disc and tape) and Interactive multimedia ➢ CD-ROMs and Digital videodiscs (DVDs/VCDs)
Web-based models	➢ Computer-mediated communication and Online courses (e-learning) ➢ Internet-based access to World Wide Web resources and Online conferences (webcasts and webinars) ➢ Virtual classes/schools (cyber schools) and universities
Mobile models	➢ Hand-held devices and Portable media players (podcasting) ➢ Smart phones/Mobile, cell phones,Tablets and E-readers

2.5 Infusion of ICT in Lesson Planning

2.5.1 Infusion of ICT in Lesson Planning

NTeQ is a morph word meaning iNtegrating Technology for inQuiry. NTeQ lesson design model was developed in response to the Internet and technology developments in education.

According to Morrison and Lowther, 2005

In order by design, the 10-step methodology includes *Specify Objectives or aims, Computer Functions, Specify Problem (difficulty), Data Manipulation (management), Results Presentation (demonstration), Activities During(while using), Before using and After using Computer, Supporting (assisting) Activities, and Assessment (for evaluation).*

Concluded the NTeQ Model, the roles of the teacher and student are altered. The training design is student-oriented meaning that students are permitted and take on the role of a researcher while teachers undertake the roles of designer, manager, and facilitator. NteQ means for iNtegrating Technology for inQuiry.

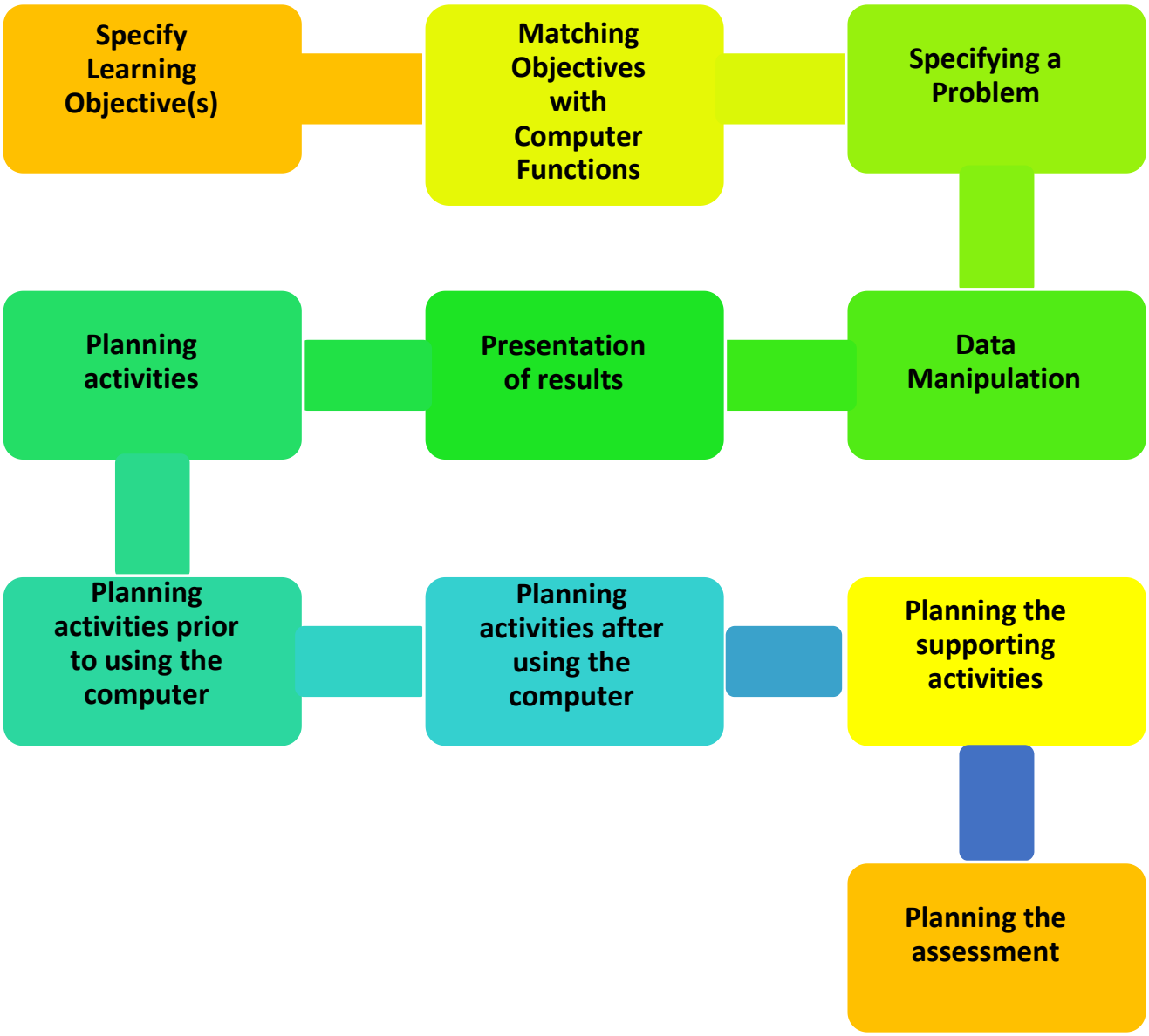
It's determination is to use the computer as an assimilated tool within the classroom. By using the computer in this way, students not only learn lesson points, but also progress real-life knowledge and skills. This type of assimilation supports the current teaching practices which highlights constructivist-teaching styles.

2.5.2 Planning for Technology Integration Lessons

Three different methods for planning technology integration lessons

- Integrating Computer Use (ICU) Template - Use to integrate computer practice into prevailing lessons - or lessons used by the teacher in previous lecture.
- Three-Step Lesson Plan Template - A fast three-step plan for instructor who has a basic understanding of integration techniques.
- NTeQ Lesson Plan Template - Delivers step-by-step direction for forming a new lesson that integrates students use of computers.

As per Morrison & Lowther, 2005 The NTeQ 10-Step Lesson Plan



Ten Stages of NTeQ lesson plan as per Morrison & Lowther, 2005

1. **Specify Learning Objective(s)** These aims should cover all the teaching for the unit or lesson, not just the material related to the computer component.
2. **Matching Objectives with Computer Functions:** A match between objective(s) and one or more computer functions is indispensable to create a successful integrated computer lesson.
3. **Specifying a Problem:** The students will investigate in the next step in the design of the integrated lesson is specifying a problem and solve as part of the informative progress. This problem supports students' advance the thinking skills and gain the knowledge specified in the objectives.
4. **Data Manipulation:** The learners will manipulate data in the fourth step to plan how it is directly related to the computer functions and objectives. (e.g. how they will organize information and do paraphrasing of information)

5. **Presentation of results:** The students have achieved the objectives. (e.g. written report, poster, presentation, artwork) What type of product will the students produce to exemplify
6. **Planning activities** although the computer Regulates what students will do while at the computer. first identify the activities the students will be involved in while using the computer, How will the students obtain information to find an answer or resolve the problem? For the project must use at least two websites.
7. **Planning activities prior to using the computer:** Once activities are determined the students will be involved in while at the computer. Then one can focus on the activities they must accomplish prior to using a computer. (i.e. accumulating data, collect materials, recognize key words before going on Internet)
8. **Planning activities after using the computer:** Activities must emphasise on exploring the results of the computer activity. If students have analyzed the outcomes of an experiment or study, they should emphasise on interpreting or on explanation of the results. Students who have investigated for information can read, summarise, compare and contrast, and comprehend the articles in a written report. The purpose of this activity is to use the information created arrangement using the computer as a tool.
9. **Planning the supporting activities:** After activities are designed that are directly associated to the computer activities, there is a need to focus on the supportive activities that also supports students achieve the objectives (i.e. Rereading videotapes,)
10. **Planning the assessment** The last and final step of the NteQ model is the development of your assessment approaches.

2.5.3 Precise guidelines for developing a supportive setting for the application of computer by students.

These guidelines will cover creating a different learning setting-

- These focus on how to create critical thinking activities besides how to create problem-based learning activities.
- It further provides more specific guidelines on how to plan and implement technology integration lessons.
- It emphasises how to know when technology use is suitable.

2.5.4 NTeQ Lesson Plan Blank Format

Lesson Title:_____

Subject Area: _____Grade Level/Class:_____

Lesson

Summary: _____

_____

_____

_____

_____

Scope _____

_____

_____

_____

_____

_____

Learning Objectives:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Instructional Strategies

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Common Core: _____

_____

Nets _____

_____

Materials/ Teaching –Learning

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Computer Function and Data Manipulation

Computer Function	Computer Application	Data Manipulation

Result Presentation:

Problem-Solving Application:

Lesson Introduction:

Computer Activities				
Activity 1 Activities to be completed	Activity 2 Activities to be completed	Activity 3 Activities to be completed	Activity 4 Activities to be completed	Activity 5 Activities to be completed
Prior going to computer 1)_____ 2)_____ 3)_____	Prior going to computer 1)_____ 2)_____	Prior going to computer 1)_____ 2)_____ 3)_____	Prior going to computer 1)_____ 2)_____ 3)_____	Prior going to computer 1)_____ 2)_____ 3)_____
At the Computer 1)_____ 2)_____ 3)_____ 4)_____	At the Computer 1)_____ 2)_____ 3)_____ 4)_____	At the Computer 1)_____ 2)_____ 3)_____	At the Computer 1)_____ 2)_____ 3)_____	At the Computer 1)_____ 2)_____ 3)_____
After going to computer 1)_____ 2)_____ 3)_____ 4)_____	After going to computer 1)_____ 2)_____	After going to computer 1)_____ 2)_____ 3)_____	After going to computer 1)_____ 2)_____ 3)_____ 4)_____	After going to computer 1)_____ 2)_____ 3)_____

Supporting Activities				
Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Activities to be completed 1)_____ 2)_____ 3)_____ 4)_____	Activities to be completed 1)_____ 2)_____ 3)_____	Activities to be completed 1)_____ 2)_____ 3)_____ 4)_____ 5)_____	Activities to be completed 1)_____ 2)_____ 3)_____	Activities to be completed 1)_____ 2)_____ 3)_____ 4)_____

Culminating Activity

_____

_____

_____

Rotation Plan

_____

_____

_____

Assessment of (Title of lesson plan)

Objective or Performance	Beginning	Developing	Accomplished	Exemplary	Score

2.5.5 NTeQ Lesson Evaluation Rubric (Rule Book) Exemplar

	4 – Exemplary (typical)	2 – Acceptable (satisfactory)	0 – Unacceptable (unsatisfactory)	Score
Specifying Goals/ Objectives	The aims were very easy to comprehend, matched the state standards, and clearly written.	The aims were easy to comprehend, matched the state standards and fairly clearly written.	The aims were not very easy to comprehend and/ or did not match the standards of state and/or were not very clear.	3
Matching Objectives to Computer Functions	All computer functions itemized, very evidently stated and very clearly matched the aims.	Not all computer functions itemized but clearly stated and clearly matched the objectives.	Computer functions not itemized and/or did not match the objectives.	4
Specifying a Problem	The problem is very suitable for both the curriculum range and the students. It is in their framework, is real-world and is one that is both stimulating and one they can definitely relate to.	The problem is suitable for both the curriculum range and the students. However, there is one or more issues with it either being in their framework, real-world or one that is both stimulating or one they can somewhat relate to	The problem is not suitable for either the curriculum area or the students. It is not in their framework and is not stimulating or one they can relate to.	4
Data Manipulation	The students very evidently comprehend what they will be doing with the computer functions, what data is available, and how it will be used.	The students evidently comprehend what they will be doing with the computer functions, what data is available, and how it will be used.	The students do not evidently comprehend what they will be doing with the computer functions nor what data is available or how it will be used.	4
Planning the Results Presentation	The results presentation is a best representation of the students' work and will very evidently provide evidence that they have met the objectives.	The results presentation is a best representation of the students' work and will evidently provide evidence that they have met the objectives.	The results presentation is not up to the satisfactory or a very good representation of the students' work and will not very evidently provide evidence that they have met the objectives.	4

Activities during Computer Use	Very comprehensive plan for what the students will be doing while at the computer. There should be no misperception and students should stay on task.	Somewhat comprehensive plan for what the students will be doing while at the computer. There may be some misperception.	No plan for what the students will be undertaking while at the computer. There will be misperception for students on this step.	4
Activities before Computer Use	Very comprehensive plan for what the students will be undertaking before going to the computer. The activity acquires students' mind thinking toward the project. There should be no misperception and students should stay on task. Students also know if they are in groups or independently.	Somewhat comprehensive plan for what the students will be undertaking before going to the computer. The activity slightly gets students' mind thinking toward the project. There may be some misperception.	Poor plan for what the students will be undertaking before going to the computer. The activity does not acquire students' mind thinking toward the assignment. There will be misperception for students.	4
Activities after Computer Use	Very comprehensive plan for what the students will be undertaking after using the computer. A Think sheet (that supports them in how to develop their results) is delivered and students are provided sufficient time to reflect and analyze prior to assessment.	Somewhat comprehensive plan for what the students will be undertaking after using the computer. A Think sheet is not delivered but students are provided some time to reflect and analyze prior to assessment.	No comprehensive plan for what the students will be undertaking after using the computer. A Think sheet is not delivered and students are simply given another project to do.	4
Supporting Activities	Very detailed Supporting activities are used to achieve upper level of Bloom's texonomy The activity either draws on another curriculum area or real-world comparisons. A Think sheet (that includes upper level questions etc.) is provided. The activity takes the lesson 'to the next level.'	Supporting activities are used but do not necessarily achieve upper level of Bloom's texonomy The activity somewhat draws on another curriculum area or real-world comparisons. A Think sheet (that may not include upper level questions etc.) is provided. The activity somewhat takes the lesson 'to the next level.	Supporting activities are either not used or but do not achieve upper level of Bloom's texonomy The activity does not draw on another curriculum area and is not real-world. No Think sheet is provided. The activity is basically 'busy' work.	4

Assessment	The assessment is very detailed and is a very good representation of what the students have been doing. It is very clear to the students what will be assessed and a detailed rubric is included on how they will be assessed.	The assessment is somewhat detailed and is a good representation of what the students have been doing. It is somewhat clear to the students what will be assessed and a rubric is included on how they will be assessed.	The assessment is not a good representation of what the students have been doing. It is unclear to the students what will be assessed and there is no rubric included on how they will be assessed.	4

Over All Score 38/40

Exemplary Score: At least 35/40

Acceptable Score: At least 30/40

Unacceptable Score: Under 30

2.6 Curating digital resources

2.6.1 Curating digital resources

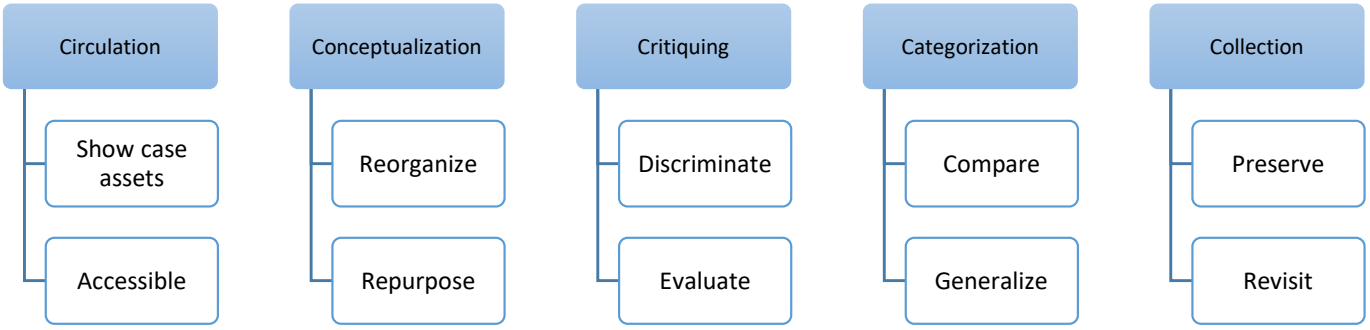
The contention provoked with an occurrence of digital materials and resources that have the potential to dramatically enhance teaching and learning practices if deliberately curated. To do this, digital materials need to be attentively quarried, prepared, and archived properly. We refer to this procedure as digital curation.

The collection and accumulating of instructional materials is not adequate; a value decision needs to be made as to the suitability of the material for the content being taught. Collections renovate into curations once a significant judgment about the suitability of the material being considered is made. Concern needs to be specified to the relevancy, correctness, authenticity, and suitability of the materials in question.

A collection can be renovated into an appropriate instructional basis through an deliberate process that practises the basis of curation. The progression of digital curation provides a means to upkeep teaching through the vigilant management and meeting of digital resources; it is a way of accumulating and generating a reviewing of what you are trying to attend to throughout the instructional process

2.6.2. A Digital Curating digital framework:

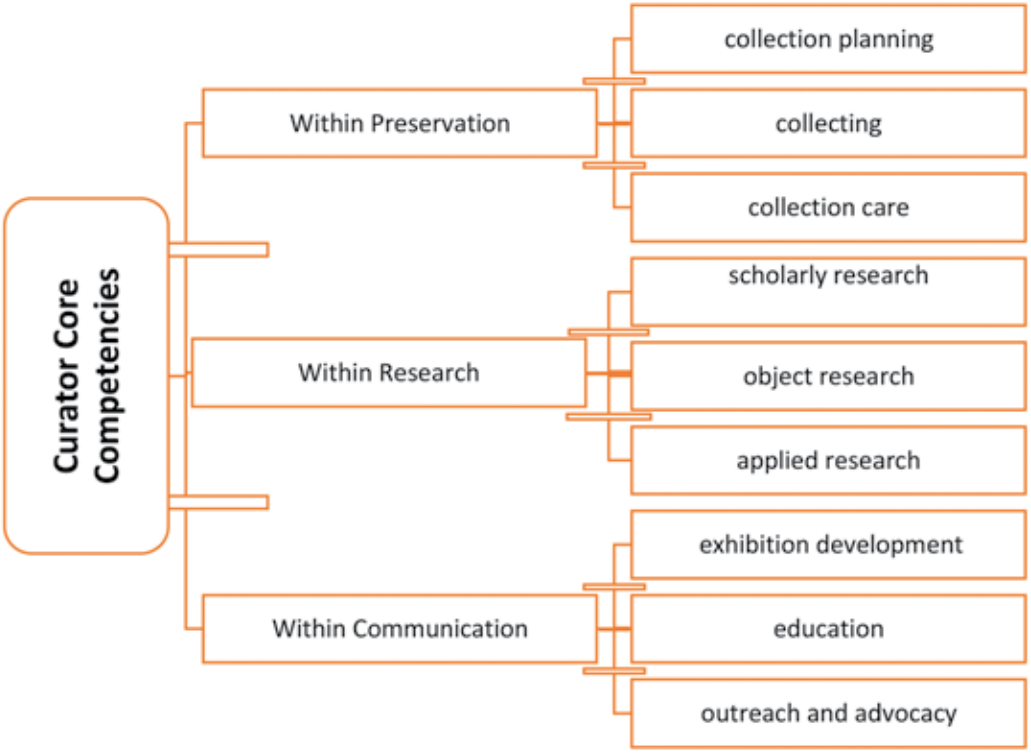
According to The framework of new media literacy studies (Vasquez et al., 2010) and new literacies studies (Gee, 2010). Digital curation is a process of five Cs, which are given below



2.6.3. Steps of Curating

1. Project a inclusive strategic plan for curation.
2. State what content essentials to be curated and generated.
3. Establish and train groups in content curation at various levels.
4. Framework the logistics of when, where, and how to curate content.
5. Develop an approach for contextualizing curated content.
6. Construct a rulebook to evaluate content for excellence.
7. Regulate how content should be stored, retrieved, and continuous.
8. Interconnect about curated content to the projected users.
9. Provide specialized learning in the practice of curated content.

2.6.4. Curator Core Competencies



Regardless to their institution emphasized area, a curator makes vitals efforts for Preservation, Research and Communication. In these three foundational elements, curators retain the following nine core competencies and related functional skills:

2.6.5.Tools for Curating Digital Resources

Flip boards, Storyful, RebelMouse, Magnify, Summify, Egentia, Shareist, Pluggio, KBucket, FlashIssue, ContentGems, Pocket, Lino, Flickr, Skitch, Sutori, Bulb, Dropbox, Wakelet, Google Sites, Paper.li, WordPress, Scoop.it!, Feedly, Evernote Web Clipper, Pinterest, curate, pearltrees, Diigo, ZEEF, LiveBinders, trap!t, 3dIssue, flockler, Kirby, BagTheWeb, Aggregage, Listly, Weje, Choosito, Mural, Symbaloo, Smithsonian Learning Lab, Artsonia Kids Art Museum etc.

2.6.6. Challenges of digital Curation

Digital Gap, Attitude, Financial, Skills, Exercise, Time are the challenges that anyone can face while preserving the digital.

2.6.7. Technologies (Digital Tools) for Teaching and Learning

2.6.7.1. Instructional Tools

- **E-learning Tools:** Adapt, Adobe Presenter, Easy generator, eXe, Geobra, Learn Bubble, Sway, TEDEd, Vyond, Xerte, PowToon, Lectora, ISpring, isEazy, HiHAHo, Evolve Authoring, EDPuzzle, Camtasia, Brachtrack, Articulate, Adopbe captivate
- **Quiz and Testing Tools:** These tools include Quizlet, ClassMarker, Hot Potatoes, MyGradeBook, Online Exam Builder, Respondus, Test maker,Easy Test Maker, Exam Buddy,
- **Educational platforms and LMS:** Axonify, aNewspring, Blackboard, Canvas, Curatr, D2L, Degreed, Edmodo, Google Calssroom, Mahara, me:time, Moodle, PebblePad, Schoology, Thinkific, Totara Learn

2.6.7.2. Content Development Tools

- **Credentials Tools:** Apple Pages, Bean, Google Docs, Libre Office, Open Office, Publisher, Word, Wordle, Zoho Docs, Writer, AbiWord, Dark Copy, Desktop Author, Scribus, Visme, Writer
- **PDF and Flipping Book Tools:** Sumnotes, Adobe Acrobat Pro, Adobe inDesign, LibreOffice, PDF Creator, PDF Pro, Booklet Creator, Flipping Book, Google Docs, Uniflip, ZonePDF
- **Presentation Tools:** Google Slides, Apple Keynote, Google Slides, Haiku Deck, PowerPoint, Prezi, SlideShare, LibreOffice, OpenOffice, Sway, VoiceThread
- **Spreadsheet Tools:** Excel, Google Sheets,LibreOffice, NeoOffice, OpenOffice, ThinkFree, Abiltiy Office, SoftMaker Office, Glide, FluSuite, Ability Office
- **Clip Art, Image and Photo Sharing platforms:** Flickr, Free Foto, iStock, Pixabay,Shutterstock, Unspalsh, Absolutely Free Clipart
- **Graphic and Info-graphic Tools:** Adobe Illustrator, OmniGraffle, Adobe Photoshop, Adobe Spark, Infogram, Canva, Easel.ly, GIMP, Typorama
- **Screen Capture and Screen Casting Tools:** BB Falshback, CamStudio, Camtasia, DemoBuilder, Geenshot, Jing, Monosnap, ScreenCastle, Screencast-O-matic, ScreenFlow, Snagit, Webinaria.

- **Audio & Podcasting Tools:** Chirbit, EasyPodcast, Adobe Audition, Audacity, iPadio, PodAdmin, GoldWave, Hipcast, SoundCoud, SpokenText, Vocaroo
- **Video & Animation Tools:** HiHAHo, Kaltura, Knovio, Adobe After Effects, Animoto, Apple iMovie, Adobe Animate, Adobe Premiere, Genial.ly, H5P, Moovly, PowToon, TED Ed, ThingLink, Vimeo, Vynod, WeVideo, YouTube
- **Augmented and Virtual Reality Tools:** Experizer Studio ,Aurasma, ENTitTi,
- **Blogging Tools:** Blogger, 21classes, Edublogs, Medium, Pebble, WordPress, Soup, Serendipity, Tumblr, Penzu, Blog.com. b2evolution
- **Web Pages/Site Tools:** Arachnophilia, Adobe Coldfusion, Drupal, Homestaed, Mozello,Firebug, Google Sites, PmWiki, Serendipity, Strikingly, Wix,
- Form, Polling & Survey Tools: addpoll, Epic Poll, 2ask, Web Online Surveys, Fo Space, Microsoft Forms, Orbeon Forms, SurveyMonkey, Typeform, Google Forms, Key Survey, Pollhost, SISSurvey, Zoho Survey

2.6.7.3. Social Tools

- **E-mail Tools:** Gmail, Mailchimp, Outlook, Yahoo Mail, 10 Minute Mial, ActiveInbox, AwayFind, eyejot, MyEmail, Pobox, Roundcube, Thunderbird.
- **Messaging Apps and Chat Tools:** AIM, Allo, ChitChat, eBuddy, Franz, GroupMe, HipChat, Messenger, Pidgin, Remind, Skype, Telegram, WhatsApp, Yahoo Messenger, Zoom
- **Discussion Forum and Web Chat Tools:** 99Chats, AVchat, Bravenet, Chatandgo, Chatzy, Discourse, Groupboard, MyBB, PanFora, Phorum, Vanilla Forums, YellBox, Zoho Chat
- **Backchannel and Audience Response Tools:** Class Pager, Google Slides, Classtime,Glisser, Kahoot, Mentimeter, Sli.do, Socrative, Plickers, Poll Everywhere, Wooclap
- **Webinar, Web Meeting and Virtual Classroom Tools:** Adobe Connect, AnyDesk, Appear.in, Blab, BlueJeans, Cisco WebEx, Drum, Flipgrid, Google Hangouts & Meet, GoToMeeting, Mikogo, TeamViewer,TeamLink,Uberconference, Zoom
- **Social & Collaboration Platform and Spaces:** Asana, Basecamp, BoostHQ, BuddyPress, Confluence, COYO, Elgg, G Suite, Google Groups, Google Spaces, Jive, Microsoft Teams, Ning, Podio, Rizzoma, SharePoint, Slack, Smartsheet, Trello, Yammer
- **Public Social Networks:** Facebook, Instagram,LinkedIn, Snapchat, Stack Overflow, Twitter, Xing, Foursquare, LibraryThing, Knack, Meetup
- **File and Resource Sharing Tools:** Dropbox, Google Drive, OneDrive.
- **Group Organisers, Scheduling and Task managers Tools:** Doodle, Timebridge, Google Calendar, WhenIsGood.
- **Collaborative Online Brainstorming and Whiteboarding:** Lino, Padlet, SpiderScribe

2.6.7.4. Personal and Professional tools

- **Personal Information Systems and Digital Notebooks:** MyInfo, OneNote, Privnote, QuickLyst,aNotepad, Breakdown Notes, Evernote, Google Keep, Knowledge Notebook, List.It, Todoist, Workflowy.
- **Research tools and Search Tools:** 43marks, BibMe, Bing, Duckduckgo, Google Search, Google Scholar, Kartoo, Mahalo, Mendeley, Quora, SimilarSites, Wikipeadia, Wolfram Alpha, Zotero

- **Curation, News, and Bookmarking Tools:** Google Alerts, Nuzzel, Paper.Li, : Anders Pink, Diigo, Flipboard, Pinterest, Pocket, Scoopit, Pluggio, MyCurator, BibSonomy, Zeef, Wakelet, TagTeam,
- **Mind Mapping Tools:** Bubbl.us, iMindMap, MapMyself, MindManager, MindMaper, MindMiester, Popplet, Cmap, FreeMind, WiseMapping, Xmind
- **Journaling Apps:** Flava, Momento, Day One, Diaro, Penzu, Writr
- **Personal Productivity Tools:** Google Earth, : Bit.ly, DeepL Translator, Google Calendar, Google Maps, Grammarly, Google News, Google Translate, IFTTT, Bit.ly, DeepL Translator, Google Calendar, LibraryThing, Office Lens, Plaxo, Wunderlist, Zapier
- **Personal and Social Media Dashboards:** Only2clcks,Middlespot, Pobb, Start.me, Buffer, Hootsuite, TweetDeck, Middlespot ,Symbaloo, Protopage.
- Digital Notebooks, Personal Learning Systems and Digital Portfolios: Google Keep, Knowledge Notebook, aNotepad, ClassMint, Evrnote, Mural, Notability, OneNote, PebblePad, SNIPPit
- Web Players and Web Readers: Feedly, Castro, Adobe Reader, Awasu, Feedly, Adobe Reader, Feedreader, Foxit Reader, Awasu, Feedly, Adobe Reader, GoodReader, Inoreader, iTunes, Kindle App, Miro, Overcast, Quick Scan, Shrook
- Web Browsers: Browzar, Firefox, Google Chrome, SlimBrowser, SwiftFox, Vivaldi, Microsoft Edge,Safari, , Opera, SeaMonkey, SlimBrowser, SwiftFox, Vivaldi
- Personal Smart Devices: Apple iPad, Apple iPhone, Android Phones, Tablet, Apple Watch, Kindle

2.6.7.5. Google Tools

Google Classroom, Google Docs, Gmail, Google Slides, Google Sheets, Google Sites, Google Slides, Google Hangouts & Meet, Google Groups, Google Spaces, Google Drive, Google Calendar, Google Keep, Google Search, Google Scholar, Google Alerts, Google Earth, Google Maps, Google Translate, Google Chrome

2.7 Sakshat and Swayam Portal for Online Access

2.7.1 Introduction

National Mission on Education through Information and Communication Technology (NMEICT) 2009, aims at utilizing the benefits of ICT for teaching and learning. To bridge the digital divide in the country, the mission aims at providing one stop solution to the educational requirements of all the learners. ICT has the power to bridge the gap created by the unequal distribution of the resources such as extreme weather conditions prevailing across the country creates gap in education. With the support of ICT, we can overcome such issues and problems. A system should have the ability to provide concrete solution to the learners to face the challenges of the future.

The mission, NMEICT, identified few challenges in making India a super power of knowledge such as lack of easily available learning material to all, the quality of teaching available at various places, less digitally literate teachers available, lack of learning opportunities available to those engaged in work to earn livelihood etc. But the mission brought few strengths into light such as a large pool of experts available in the country to develop content, a large section of the population wanting good quality education and also huge number of leading Institutes available across country to contribute in the technological aspects of creating the content and courses.

The main objective of NMEICT is to raise the levels of education of India and transform the education system. So NMEICT, with its aim to provide the one stop solution to the learners, nurturing the talent and provide an opportunity of lifelong learning, strengthened Sakshat Portal. This is an official website of NMEICT.

2.7.2 SAKSHAT: A One Stop Education Portal

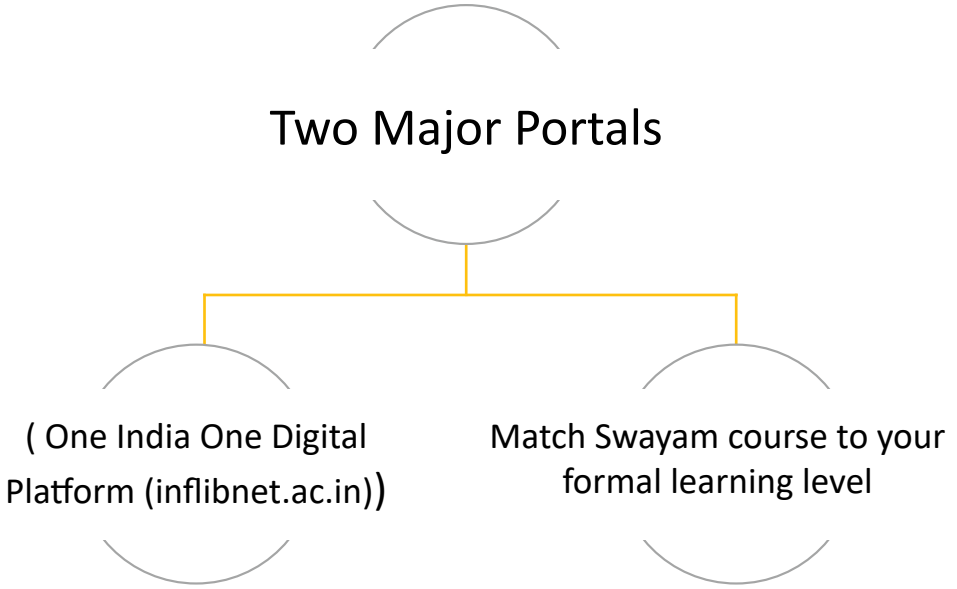
SAKSHAT | National Mission on Education through Information and Communication Technology

SAKSHAT: A One Stop Education Portal, the pilot project was launched on October 30, 2006 to facilitate lifelong learning for all and provide an opportunity for those engaged in earning. Sakshat is developed to provide knowledge free of cost to all. Sakshat includes experts from educational institutions like Indira Gandhi National Open University (IGNOU), University of Delhi, Kendriya Vidyalaya Sangthan (KVS), Navodyaya Vidyalaya Sangthan (NVS), National Institute of Open Schooling (NIOS) and National Council for Educational Research and Training (NCERT) and prominent academicians in the field.

Sakshat makes use of all the latest multimedia technologies to make learning interesting. The portal has content packages to suit the academic needs of the students at various levels. It overcomes the challenges of lack of good quality content available to all, lack of experts available at hand and digital divide.

With this portal, good knowledge resources are available on the web at public domain free of cost. With the internet and a computer, many problems of students can be solved specially which are faced because of geographical location and lack of opportunities in the area, through sakshat.

Sakshat has two major portals where various learning courses can be found. These two major portals are



- **One India One Digital Platform** is an e content portal that has facility to search all content from Class I to PG level. The material includes audio-video learning material, text material and material enriched with multimedia etc.
- Match Swayam course to your formal learning level which provides opportunities to learners to map their formal learning level course with Swayam course and learn more through e courses

related to their formal course available on the sakshat platform. This portal has courses mapped by:

- **TEQIP** (Technical Education Quality Improvement Programme) mapped courses on Swayam
- **AICTE** (All India Council for Technical Education) mapped courses on Swayam

Sakshat caters to the needs of various learners from class I to PG. It contains links to various e learning platforms such as Swayam, Swayamprabha, e Yantra, Samarth, Virtual Labs, Spoken Tutorials, Baadal, Shodh Shudhhi, e pathshala, FOSSEE and so on. Sakshat is addressing the needs of almost all the areas of education.

It has the power to enable students to acquire knowledge of the fields that is otherwise difficult to access. The disadvantaged students across the nation can benefit from the Sakshat Platform. Following figure shows the platforms and portals for e-learning available on sakshat platform:

2.7.2.1 Portals or links under sakshat platforms

School level	Undergraduate level	Postgraduate level	Other Online Learning Platforms
Swayam Swayam prabha NDLI Spoken Tutorial NISHTHA	Swayam Swayam Prabha NDU Spoken tutorial FOSSEE E YANTRA E SHODHSINDHU Virtual labs SHODH SHUDHHI SAMARTH BAADAL VIDWAN	Swayam Swayam Prabha NDU Spoken tutorial E Yantra E Shodhsindhu Virtual labs Shodh shudhhi SAMARTH BAADAL	IIT Bx IIM Bx Electronics & ICT Academy NEAT-AICTE NROER DIKSHA SHAGUN E-Pathshala Video Conference & LMS

1. **Swayam** (click on the link to visit website "Swayam Central" (press ctrl and click)): Swayam is a platform that takes quality teaching-learning resources to the most disadvantaged section of the society. It has courses from class 9 to Postgraduate free of cost.
2. **SwayamPrabha** (click on the link to visit website "Swayam Prabha | 34 DTH channels | India" (press ctrl and click)): SwayamPrabha is a group of free educational TV channel. It has 22 DTH channels that telecasts high quality educational programmes of school education and higher education 24x7 using GSAT-15 satellite. NPTEL, IITs, UGC, CEC, IGNOU develops content for swayamprabha.
3. **Spoken tutorial** (https://spoken-tutorial.org/): This project is funded under NMEICT to promote software learning. Anyone can learn open source softwares through spoken tutorials free of cost. Spoken tutorial forum help provides opportunities to raise the voice, connect with the world and collaborate in new learning.
4. **NISHTHA** (National Initiative for School Heads' and Teachers' Holistic Advancement) (press ctrl and click) (NISHTHA (ncert.gov.in)): To realize the vision of NEP2020, NISHTHA an integrated training program was launched for school heads and teachers to provide Continuous Professional Development (CDP) opportunity.

5. **Samarth** (https://samarth.edu.in/): Samarth (eGov suite) is a University Information Management System(UMS) project designed and developed by IIC, University of Delhi, in collaboration with the Ministry of Education (MOE). It has 9 core modules and more than 40 sub modules. With the help of Samarth, universities are able to move away from paper systems and third party ERP systems to a system which is secure, reliable and could be scaled up.
6. **E yantra** ((press ctrl and click) e-Yantra): E yantra is a robotics outreach program hosted by IIT Bombay. Under this program, e yantra labs are built in colleges and institutes to facilitate training to students. These labs provide wider opportunities to connect with the innovation community. There are more than 400 e yantra labs across India.
7. **E ShodhSindhu** (https://ess.inflibnet.ac.in/): E-ShodhSindhu provides access qualitative e-resources including full texts, bibliography, databases, e journals and e books.
8. **FOSSEE (Free/Libre and Open Source Software for Education)**: FOSSEE project promotes the use of FLOSS tools in academia and research. To reduce the dependency on proprietory software, FLOSS tools are developed to improve the teaching and learning process. The project is part of the National Mission on Education through Information and Communication Technology (ICT).
9. **E pathshala:** ePathshala is a portal/app developed by the CIET and NCERT. Through e pathshala app/portal, e books of NCERT can be accessed by the teachers, students, educators and parents.
10. **Virtual labs:** Virtual labs project is an initiative to provide good labs experience to institutes and colleges who do not have good quality labs or equipment in their institute or college.Virtual labs is paradigm shift in ICT based education.
11. **NEAT-AICTE:** National Educational Alliance for Technology is a public- private partnership with the government where industries will showcase products developed for learners at national portal.

Sakshat with all these e resources and portals provides the learners with best quality content and courses from school level to higher education level.

2.7.3 SWAYAMPORTAL (Study Webs of Active–Learning for Young Aspiring Minds)

(https://swayam.gov.in/)

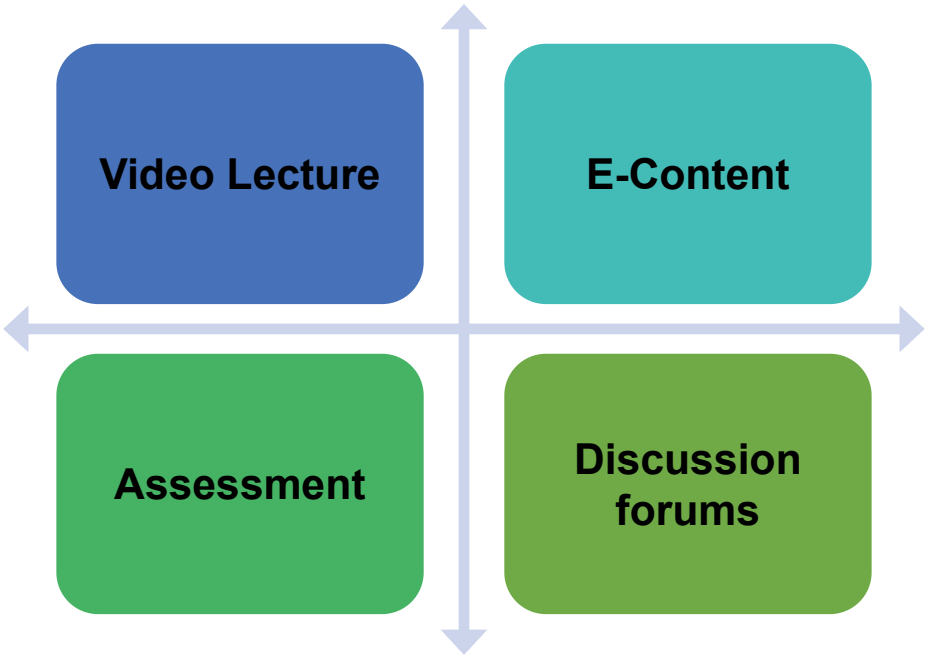
To achieve the three principles of Education Policy, ie., access, equity and quality, Swayam Platform was designed and developed. It was designed with an objective of taking the quality education and the enhanced teaching learning resources to the most disadvantaged students. Swayam aims at connecting the learners with the pool of education who have been left behind and not able to join the mainstream knowledge economy.

Swayam platform hosts courses from class 9 to postgraduate level that can be accessed by anyone anytime and anywhere. The courses designed are interactive and prepared by best quality teachers across India. All the courses are free of cost on swayam platform.

2.7.3.1 Four Quadrant Approach

Four quadrants approach is followed by Swayam. Swayam is an e learning system that includes

1. **Video Lecture:** The lectures or tutorial developed contains videos and audios. These tutorials or courses are designed using animations, graphics, video demonstrations and simulations, virtual labs.
2. **E- Content:** The platform contains specially designed reading material that can be downloaded and printed anytime from anywhere with the help of the internet. The material has web resources such as references, links for journals, case studies for further reading. The material is self-instructional material.
3. **Assessment:** Each course has self-assessment tests or quizzes. The test contains questions of all types such as multiple choice questions, short answer type, long answer type and fill in the blank type questions.
4. **Discussion forums:** Students are not left with doubts alone. An online discussion forum is created for clearing the doubts and handling the queries of the students. Doubts are raised by the learner and cleared by the course coordinators.



2.7.3.2 National Coordinators

To prepare, design and deliver best quality content, nine National Coordinators have been appointed. They are:

National Coordinators	Courses/ Education
1. **AICTE** (All India Council for Technical Education)	• For self-paced and international courses
2. **NPTEL** (National Programme on Technology Enhanced Learning)	• For Engineering courses

3. **UGC** (University Grants Commission)	• For non-technical post-graduation education
4. **CEC** (Consortium for Educational Communication)	• For under-graduate education
5. **NCERT** (National Council of Educational Research and Training)	• For school education
6. **NIOS** (National Institute of Open Schooling)	• For school education
7. **IGNOU** (Indira Gandhi National Open University)	• For out-of-school students
8. **IIMB** (Indian Institute of Management, Bangalore)	• For management studies
9. **NITTTR** (National Institute of Technical Teachers Training and Research)	• For Teacher Training programme

2.7.3.3. Enrolment

Enrolment is hassle free on Swayam Platform. Learners can easily enrol in any course as per their need and skills.

Steps

- The learners can sign in and register for free on swayam portal.
- After signing in, learner can choose the course as per their choice after reviewing the courses in course catalog section.
- Under the course catalog section, learners can view
  - the national coordinator running the course
  - course duration
  - exam date
  - and course credit of each course

Enrolment can be done from anywhere and from any device. A device with connectivity is all the essential requirement for pursuing the course.

2.7.3.4 Courses

Swayam platform provides a varied range of courses for the learners. The learners can match the course with their learning levels or fields and get certified in the course. The self-dependent and lifelong learners find it easy to pursue such courses as provided on Swayam Platform which are flexible in all aspects. Learners can pursue the course at their own pace in the specified duration of the completion.

Click on "ALL COURSES" button on the website to view the courses or press ctrl and click here [Swayam] to view the courses on Swayam Platform.

Courses available on the Swayam platform are in following category:

1. Annual Refresher Programme in Teaching (ARPIT)
2. Architecture and Planning
3. Engineering and Technology
4. Humanities and Arts
5. Law
6. Management and Commerce
7. Maths and Science
8. NPTEL Domain (Engineering courses)
9. School
10. Teacher Education

A wide range of courses are available to meet the needs of the learners. Each course page clearly specifies the following

- Objectives of the course
- Target group
- Bio of the instructor
- Course layout
- Procedure to obtain certificate
- Exam pattern
- Summary mentioning the course details
- References to visit the websites and read
- The books for the course

Duration of each course is different. A course can end in 4 week or can take 24 weeks to complete. Few courses do not specify any course completion duration, these are self-paced courses. Learners can complete these courses and get the certificate after meeting the said criteria. Learners can develop the skills and knowledge anytime.

2.7.3.5 Assessment on Swayam Platform

Assessment is an essential aspect of every course. Assessment gives an idea about how much the learner knows and comprehends the knowledge gained during the course. The self-paced courses like the one offered at Swayam platform, needs an effective assessment of the student for the certification.

Swayam platform provides free of cost courses to the learners but to procure a certificate, a nominal charge has to be paid by the learners. Learners have to appear for the proctored exams at the designated centre on the said date. Eligibility for the certificate is specified on the course page and learners get certificates only if the said eligibility or score is attained.

Courses have different criteria for marks. Few courses have 30% as internal marks and 70% as external examination marks. Some courses require 70% marks in the computer based testing exam, i.e., CBT exam as essential criteria to obtain a certificate.

Swayam platform is providing best quality resources across the country with the use of ICT. It has become a successful centre for online courses from high school to higher education level and skill oriented courses. It provides a high quality learning experience with multimedia.

Swayam Platform and Swayam provides equal opportunity of learning to everyone. They provide high quality learning resources. Both have immense capability to reach the remote learners using media technology. They can revolutionise the education system and transform the classroom environment.

2.8 Digital Story Telling and Story Boarding

2.8.1 Story telling

Storytelling is an old method of sharing experiences, developing insight into the past, instilling moral values and passing the historical facts, traditions and beliefs to the next generation. Storytelling is The oldest method of interacting, communicating and teaching in a meaningful manner. It's all about using stories to amaze your audience or clarify something. A good story teller can help create complete visualization of the story in the mind of the listener.

Storytelling requires command over voice modulation and expressions. The listeners should internalize the whole concept through the story. Communicating and interacting in an effective manner makes the story interesting. Storytelling in an art that requires active participation of the listener. Without enhanced communicative skills or tools, it becomes difficult to attract the audience.

Communicating stories with the help of digital tools makes it more engaging and interesting. As said **by Bernajean Porter, "A story should be remembered for its soul and not the bells and whistles",** the digital tools and multimedia makes a story soulful. The audience connects with a digital story in an unprecedented manner.

2.8.1.1 Types of Storytelling

There are commonly four styles of storytelling which will help us understand how storytelling has evolved over the time.

1. **Oral Storytelling:** The oldest way of telling stories is through words. Verbal communicative skills catch the attention of the audience and captivate people through words. People used to share the stories through words. Experiences of the past, historical events or moral stories were communicated through words.
2. **Visual Storytelling:** Visual storytelling requires images, graphics and figures depicting characters and animals. Visual storytelling is ancient method of sharing the history and experiences through carvings on walls and caves. Painting of animals, human figures, pictures of places and events tell stories of ancient times. Modern storytelling also includes visuals of high definition to connect with the audience.
3. **Written storytelling:** With the invention of written words, stories were communicated in written form as well. Written storytelling method is useful to store the stories and pass them to the next generation. This style of storytelling method requires good written skills that can communicate the emotions, expressions and scene through written words.
4. **Digital storytelling:** Digital storytelling is powerful to connect with the audience. Digital resources make stories interesting. These stories can be shared to a wider audience with the help of the internet. With the help of social media platforms, many storytellers have emerged who tell stories of their daily life experiences and connect very well with people and get millions of views on their videos.

In this chapter, we will be discussing digital storytelling method in detail.

2.8.2 Digital storytelling

Digital storytelling is an art of integrating media tool, graphics, animations, audio, texts and other computer based techniques in a story. It is basically a computer based technique of telling stories. A pioneer in the field of digital stories, British photographer, author, and educator Daniel Meadows **defined digital stories as "short, personal multimedia tales told from the heart"**. According to Daniel Meadows, the best thing about this form of digital expression is that these stories can be created by anyone on any subject and can be shared with people across the world through electronic media.

According to **UNDP**, Digital storytelling deepens understanding and it is a powerful medium to pass information to the next generation. Digital stories connect the audience emotionally and result in long lasting learning with a greater impact.

The story developed or created through the use of multimedia can vary in length. The duration of a story can be from 2 mins to 15 mins or beyond that. It is believed that long stories tend to lose its audience so stories should bind the audience for a limited time and be able to transmit the content in an effective manner.

2.8.2.1 Importance of digital storytelling in education

- An engaging multimedia rich content material can catch the attention of the students more and makes learning interesting.
- It encourages the learners to explore new ways and ideas to develop insights in the concepts
- Teacher made digital stories enhance the lesson, facilitate discussions about the content presented through the digital story.
- By understanding the content through multimedia in a storyline, learners are able to retain the information better.
- With the use of digital tools in presenting a story, difficult and complex topics can be easily understood.
- It is a powerful tool for the educators to use in the classroom for developing the creative skills of the learners.
- Digital stories promote critical thinking as it gives a chance to understand the topic from many corners with animations, graphics and sound making it more relatable and connected.
- With digital stories, abstract concepts can be easily visualized and makes the way for deeper understanding.

A generation that stays in a digital world all the time which is full of High Definition (HD) tools and devices, classroom teaching and learning cannot be enjoyed in traditional ways. Diverse learning styles have emerged that require teachers to be well equipped.

2.8.2.2 Process of creating Digital story

Creating a digital story is a process that requires careful selection of elements. One can follow the below mentioned steps for creating a Digital Story:

1. **Select the topic of the content:** A suitable topic of the content has to be chosen for the digital story. The topic selected should have the ability of converting a storyline. Try to select the topic which is difficult for the students to understand and visualize so that digital story could clear the topic well.
2. **Map the content:** In this step, map the size of the content so that the learners are not overloaded with the content in the digital story. Keep the content not too long.
3. **Give a title:** Now give a title to your digital story. Title should be short and in easy language. It should create curiosity in the minds of the learners.
4. **Plan the story, the script and the visuals:** After selecting the topic, the creator has to plan the storyline, write the script and simultaneously select the image or visuals to be put in the story. Select and think of the visuals or images while writing the script so that changes could be made then and there. Sometimes the creator is unable to find the suitable image for the script written then the script has to be changed.
5. **Create image/animations/gifs files for the story:** After knowing what suitable and relevant images will be put in the story, the developer will create the image files using softwares like photoshop, corel draw and take it from some open source softwares.
6. **Create audio files:** Once the storyline is ready with images and visuals to be put, the developer will work on audio or sound track. Script can be recorded through some voice recorder device or computers also has audio recorder installed in it. Audio should be sequentially set with each line of the script and images.

7. **Set the digital story:** Bring everything together at this step. The script prepared, the images/ visuals selected and the sound files created have to put together now. Each image should match the sound or the audio script. Keep the pace of the story not too fast or slow.

2.8.2.3 Few of the ICT tools available to create digital story

Tools to create Digital Story	Link and features
1. Canva	• **click on the link** (https://www.canva.com/) to create a digital story. • An Australian platform for graphic design, used to create social media graphics, presentations, posters, documents and other visual content.
2. Animoto	• **click on the link to visit website and create a wonderful digital story** https://animoto.com/ • Animoto helps in creating videos from photos, video clips, web based presentations. Animoto is New York City based with an office in San Francisco.
3.Toontastic	• https://toontastic.withgoogle.com/ • Toontastic is a 3D story creation app. It can be downloaded from goggle play store or App Store. • One can download Toontastic for phone, iPad and computers
4. Adobe Slate	• Click on the link to have an overview of the app https://www.youtube.com/watch?v=nGsUJ3gV8zU • Adobe Slate is a virtual story creator app for iPad. It turns images, video clips into beautiful virtual stories that can be published.
5. Sock Puppets	• Sock Puppet is a terrific app that allows children to reenact a historical scene by writing a script and recording their voice! It creates wonderful virtual stories.
6. We video	• https://www.wevideo.com/ • we video is an easy way to create stories virtually.

Students can explore more apps and websites to create digital stories. Digital stories with animations and graphics attract students and lesson plan interesting. With in-built tools for designing characters, places, expressions and people, lot of students get chance to create the story easily. They are the powerful way of expression and carrying forward the history of any nation.

2.8.3 Story Boarding

2.8.3.1 Introduction

Story boarding is a systematic and sequential arrangement of visual/images of a story along with script. It is basically small boards with pictures representing each scene to be shot and script of that scene or shot. Story boards are a sequence of events. It is concerned with the continuity of the story step by step.

A storyboard is a visual representation of a movie sequence that divides the action into separate panels. It's a collection of drawings in a specific order, complete with camera direction, dialogue, and other important features. It depicts the shot-by-shot progression of a video.

Traditional and thumbnail storyboard styles are the two most common types.

Traditional storyboards are simple pencil sketches with specific information such as camera movement arrows, characters, props, and so on.

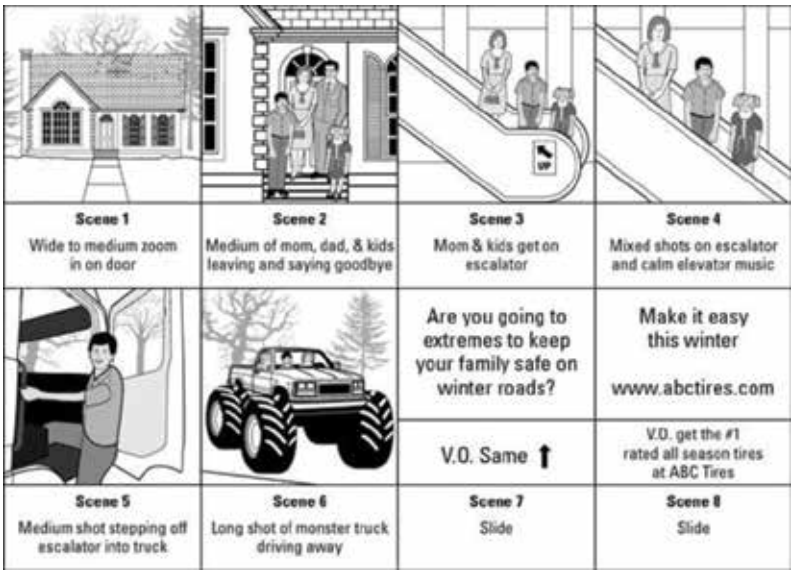
There are other storyboards in the thumbnail style that don't have any writing on them. These are not in detail and have less writing.

2.8.3.2 Features

Following are the few features of Storyboarding:

- Storyboarding is scene by scene visualisation of the entire Story to be shot.
- Each small board represents a scene with script.
- All the small boards are arranged in sequential order.
- It is pre visualization of the entire story.
- Story boarding gives a chance to analyse and correct the Scenes before making the digital story.
- Wastage of time and resources could be minimized at the time of development with effective and correct story boarding.
- Storyboards can be created for movies, animations, games, video, lessons and instructions.

2.8.3.3 Sample of story boarding



Source: dummies.com (https://www.dummies.com/wp-content/uploads/321900.image0.jpg)

2.8.3.4 Story boarding and Education

In story boarding, the developer creates visual sequence of the entire story and can view how the final product will look like. This can be used to meet the needs of different styles of learning. It can be a

very effective tool for teaching and learning. The students can learn effectively through storyboarding in the following manner:

- The entire lesson can be divided into smaller visual units in a sequential order in storyboarding. Hence visualization is enhanced and it becomes easier to retain the concept.
- Story board when used as a teaching strategy gives a chance to students to be innovative designers and effective communicators. Students learn to identify gaps that could be in the final digital story or project.
- Story Boarding helps in language learning. Storyboarding is a collaborative method that allows students to express nonverbal messages through drawings to supplement spoken discourse, as well as to lay out and structure a tale in sequenced illustrations, with the possibility of second language learning.
- In Mathematics, storyboards can be used an inductive strategy to reach final conclusions and generalise the concept at the end. The theorems and properties can be taught through storyboards. Students can create boards on steps followed in a theorem and see the errors themselves. Students can learn the importance of sequence and order through story boards.
- Science students can depict a science experiment through story boards. Various concepts can be easily depicted and presented through storyboards. Various experiments of chemistry, life cycle and body systems taught in biology, derivations of physics can be presented through storyboards.
- Historical facts and timeline of ancient period can be prepared on story boards. Students can memorize the dates and periods of history easily through storyboards which otherwise becomes difficult to retain.

Therefore, storyboards find its place in almost all the fields of education.

2.8.3.5 Tools for storyboarding

These are few tools, apps and software to create storyboards. Names and links of the few storyboard creating websites and app are shared below:

1. **Boords - https://boords.com/**
2. **FrameForge- https://www.frameforge.com/**
3. **Canva- https://www.canva.com/**
4. **Storyboard That- https://www.storyboardthat.com/**
5. **Studio Binder- https://www.studiobinder.com/blog/story-outline/**
6. **Plot- https://theplot.io/**
7. **Storyboard Quick** - Storyboard Quick is an app that can be downloaded from the play store.

Few of these websites have ready to use graphics, images and scenes which can be directly inserted into the boards. The colour, scenes, shapes and location can be choosen according to the need of the story from options available. Save each board and download from the website.

Storyboards are popular because we know that graphics mixed with words provide a rich synthesis of information that may both entertain and inform.

2.9 Cyber Crimes: Concerns And Implications, Software Piracy and Legal Remedies

2.9.1 Introduction

Cyber crimes are crimes committed with the help of a computer, internet or some computer technology. Cyber crimes can be any crime related to illegal acts done through computer such as illegal online theft, hacking someone's account, making duplicate social media account in somebody else's name and sending absurd messages etc. It can be misusing personal information such as aadhar card, debit card number etc.

According to **National Cyber Crime Reporting Portal of India, Cyber Crime may be defined as "an unlawful act where a computer or a communication device or computer network is used to commit or facilitate the commission of crime".**

U.S. is a signatory to The Council of Europe Convention on Cybercrime defines cybercrime as "a wide range of malicious activities, including the illegal interception of data, system interferences that compromise network integrity and availability, and copyright infringements".

Availability of the internet all the time has increased the pace of cyber crime activities. Criminals find it easy to carry out crimes like stalking, bullying and threatening over the internet as the criminal is not present at that moment.

2.9.1.1 Major Issues and Concerns regarding Cyber Crime

Technology driven society brings technology related issues. Today, major crimes are committed through technology. Thefts, data breaching, harassment, trafficking, abuse and threatening, stalking are committed through technology with the use of the internet All these acts are unlawful and utilise digital tools as medium to fulfill motives.

Few **types** of the cybercrimes stated in the **National Cyber Crime Reporting Portal of India** are,

1. **Child Pornography/Child Sexually Abusive Material (CSAM):** Child sexually abusive material contains images of child who is sexually abused or exploited. It is a punishable cyber crime to publish or transfer such material digitally.
2. **Cyber Bullying:** Cyber bullying is bullying using technology. It is online threatening, harassing or abusing someone.
3. **Cyber Stalking:** Cyber stalking is following someone over the internet. The cyber criminal constantly tracks someone's activity over the internet and often threatens or harasses someone online.
4. **Cyber Grooming:** The criminal tries to be a friend to a young or teenager person with intention of gaining sexual favour. The predator generally builds virtual relationship or an emotional bond with the motive of sexually abusing or exploiting the victim.
5. **Impersonation/ Identity Theft:** Identity Theft is illegally obtaining someone's personal information such as name, aadhar card number, address, bank account number and using this information without permission. The fraudster can use the stolen information to hack personal social media accounts or bank accounts. One should never save password on someone else's computer and always log out successfully after using the account.

6. **Phishing:** Phishing is a cyber crime in which email is used to do the fraud. The fraudster steals confidential information such as card number, banking passwords, CVV number, ATM PIN etc by sending email to the victim. The email sent to the victim seems to be from the original source.
7. **Spamming:** Spamming is when a company repeatedly sends bulk messages through mail or text messages. It becomes a cyber crime because spammers' constantly tries to persuade to buy certain products that you are looking for on the internet. Few fraud companies store your credit card/ debit card details when you make payment and use your personal information for online thefts.
8. **Data Breach:** It is a security breach in which highly sensitive or confidential information is leaked. It is unauthorized access of data.
9. **Website Defacement:** It is a cyber crime in which a website is hacked and the visual appearance of the website is attacked. The hacker posts indecent messages, videos, obscene images and absurd content etc. Sometimes the website is made non functional.
10. **Pharming:** Pharming is a cyber crime in which a bogus website is made and original website's traffic is redirected to the new bogus website. It is similar to phishing in which data of the customers is manipulated and stolen.

2.9.1.2 Implications

Cyber crimes are done to satisfy certain drives and motives. As people are connecting more through digital technology and are dependent on digital tools for all sorts of needs. The criminals also have to find their prey through digital mediums such as social media apps and websites, shopping offers and coupons, banking websites etc. The society is badly affected by the huge dependency on digital devices and this has resulted in the increase in crimes over the internet using technological tools, which is known as cyber crime. Some of the implications of cyber crimes are:

Financial Implication

Most of the cyber crimes are carried out with the purpose of extracting money. Theft is the main motive of such criminal activities. Cyber crimes such as phishing, cyber stalking and identity theft/ impersonation are done to steal money from the victim's bank account. With the rise in unemployment, the educated youth of many societies are committing such illegal acts. Due to cyber attacks, companies sometimes suffer huge financial losses, and few find it difficult to recover.

Non financial implications

Illegal cyber acts like sexting, cyber stalking, cyber grooming are committed to get some sexual favours from the victim. There may be other non financial implications that includes loss of reputation, loss of trust and belief. Cyber crimes such as phishing and pharming creates huge loss of reputation of the companies which cannot be recovered early. It takes time for companies to build trust and once it is lost in such a competitive market, it becomes nearly impossible to get the customers back.

2.9.2 Software Piracy and Legal Remedies

2.9.2.1 Concept and Meaning

"Software Piracy" the term contains two terms that is **software and piracy**.

Software can be defined as set of instructions given to the computer to perform certain task. It is said to be a data or program that tells the computer what to do. It helps the computer in completing specified tasks for which the software has been developed.

Piracy is an act of robbing and stealing. It can also be understood as duplication of someone's work and selling it at lower prices.

Hence, **Software piracy** is an illegal act of copying and distributing software without the permission of the owner. It is transferring and sharing the software without a license. Copying the software illegally or without pursuing the license creates copyright issues. Software piracy is an act of stealing the software.

Software piracy is an unauthorized use of copyrighted software. It is a global issue where any person with a computer becomes a pirate who does not have knowledge of software piracy laws. It does not necessarily require knowledge of coding or specialized technical skills.

As defined by Panda Security, **"Software piracy is the act of stealing software that is legally protected. This stealing includes copying, distributing, modifying or selling the software".**

2.9.2.2 Types of Software Piracy

1. **Counterfeiting:** Counterfeiting is the illegal duplication of a copyrighted product or material. According to **International AntiConterfeiting Coalation (IACC)**, counterfeiting is a crime. It is a Fraudulent imitation of a trusted brand or product. Many products are Counterfeited such as toys, electronic items or devices, medicines, automobile parts. Counterfeited products are available at lower price than the original products. It can be very dangerous incase of medicines and automobile parts. It can make you pay heavier price later.
2. **Softlifting:** Softlifting is when a version of software is purchased and downloaded on multiple computers. This is the most common type of piracy. This type of piracy mainly happens in school environment or businesses to save money. It is a crime because the software license says that it should be downloaded on one computer only, people download it on many computers.
3. **Client-Server overuse:** In client server overuse, original copy of the software is used by many people on the same network at the same time. It is a type of software piracy because the license doesn't allow for so many copies to be downloaded. This is an end user piracy.
4. **Hard-Disk loading:** When someone buys a legal version of a software and makes copies of that software. These copies and installed on multiple computer hard disks and sold in the market. The pirater sells the illegal copy of the software at cheaper rates than the price of the original software.
5. **Online Piracy:** Online happens when pirated software are procured through the internet. The Internet is used to sell, share and acquire illegal software. It is a common practice in which illegally downloading of the material is carried out without permission of the owner. It is also known as internet piracy as the internet is used to illegally copy a copyrighted content.

2.9.3 Legal Remedies for Software Piracy (https://copyright.gov.in/)

Most software has been switched to a one-user license, which means it can only be redeemed once by one user for his use alone, software piracy has become much more common in this generation of technology. It is prohibited to distribute this software, such as by sharing it with a friend or via the internet.

Copyright is one mechanism for preventing piracy of a person's intellectual property. It is the legal right that a creator of intellectual property has to replicate and redistribute his work at his leisure. To prevent and punish copyright infringement, copyright holders frequently use legal and technological methods.

Rights of the owners of the intangible property such as software, computer systems, web pages etc have exclusive property rights called Intellectual Property Rights that protect their creative work from exploitation.

In India, **The Copyright Act 1957**, is the main statute for all copyright-related laws and it was enacted to address copyright and copyright infringement problems. **Literary works, theatrical works, musical works, artistic works, cinematograph films, and sound recordings all have copyright protection under section 13 of the Act.**

The 'computer programme' is included in the Act's definition of a 'original literary work,' its infringement will result in substantial criminal and civil penalties.

- The Act expressly states that any act carried out by an unauthorised person with software that was legal for the authorised licensee to carry out will result in civil remedies such as injunctions, damages, and other administrative measures by administrative authorities to protect copyrighted software.
- The Amendment in the Act also provide criminal remedies, such as penalties for copyright infringement Section 63B of the Act stipulates a minimum sentence of 7 days, which can be increased to a maximum of 3 years, as well as a fine of up to 15,000 which can be increased to 2 lakhs at the judge's discretion.

2.10 Plagiarism and Fair Use

2.10.1 Plagiarism

2.10.1.1 Meaning and concept

Plagiarism is an act of copying someone's idea, text, or work and passing it as your own. Plagiarism can be defined as a practice of stealing other person's work or creativity. It is presenting other's work as your own. Plagiarism hampers creativity, orginality and affects academic integrity as it is an illegal act of theft.

According to the **Merriam-Webster online dictionary, to "plagiarize" means**:

- It is an act of stealing and passing the ideas or words as one's own
- Plagirism happens when you use other's work without giving credit to the original creator
- To commit literary theft is plagirism.
- Plagirism happens when one present a new and original idea or product derived from an existing source

According to U.S. law, words and ideas can be stolen. The expressing ideas is considered as intellectual property and copyright laws protect the originality of literary material or content.

Every now and then, we come across the news of copying or stealing someone's work without permission. The musicians, journalists, writers, artists and researchers steal or copy literary work, creativity, innovation or ideas of someone and publish as their own work.

2.10.1.2 Categories of Plagiarism

Broadly we can divide Plagiarism into following categories as

1. **Intentional Plagiarism:** When knowingly and deliberately things are copied and no credit is given to the original developer or creator, this is called Intentional Plagiarism. Intentional Plagirism is

an act of copying or pasting from internet sources and presenting it as one's own. When someone is paid for writing a paper for you is also Intentional Plagiarism. Sometimes, intentionally people copy someone's work as they do not have original idea and lack creativity.

2. **Unintentional Plagiarism:** It can happen in following cases
   - When the person is not confident enough to write the content so he/she copies it from somewhere directly.
   - Lack of awareness about copyright laws and Infringement issues.
3. **Self Plagiarism:** Self-plagiarism is also known as text recycling. It is a process of reproducing one's own work that is already published without proper citation. In self plagiarism, a part of or whole content is republished which is not acceptable.

   Self plagiarism includes without giving citation reusing of a data that is already used in some published work, or sent for publication, in another work. Sometimes, people break up one's own larger study into smaller parts and publish them as new study without due and full citation, then self plagiarism happens.
4. **Accidental Plagiarism:** Accidental plagiarism happens when the developer or creator does not appropriate knowledge of citation and referencing style. It is also unintentional plagiarism and happens only because of wrong citations or improper citations.

2.10.1.3 Ways to avoid Plagiarism

Avoiding plagiarism is actually understanding the ways by which plagiarism does not occur. We can avoid intentional or unintentional plagiarism if we truly understand that plagiarism is an act of stealing someone's original work. Following are few ways by which plagiarism could be avoided:

1. **Summarize:** Summarizing is a practice of giving complete information in one's own word. A summary is condensed form of a major idea or content. It is generally shorter than original text. These days few summarizing tools are also available online such

   1. Prepostseo (https://www.prepostseo.com/tool/text-summarizer),

   2. Quillbot (https://quillbot.com/summarize)
2. **Quotation marks ("... "):** Using quotation marks helps in avoiding plagiarism. Quotation marks are used for the sentences that are exactly copied from the original text. While using quotation marks for the copied material, the writer should also mention phrases like as stated by, according to , in words of, as said by etc to indicate that the words are exactly stated as in original text.

   For example, According to Britannica dictionary, plagiarism is defined as "..." . Always provide references at the end of such copied material.
3. **Citations:** Citations helps in tracking the original source of the text or idea. It is a method of writing the sources of the main idea of the content. It is a way of giving credit to the main writer, developer, innovator or creator. The most common style of citations are

   i. **American Psychological Association (APA) Style** generally used by educationist, psychologist, linguistic studies, business and economics.

   ii. **Modern Language Association (MLA) Style** used by humanitarians and writers

   iii. **Chicago/Turabian Style** generally used in history, philosophy, anthropology and fine arts subjects.

iv. **IEEE used** in computer science, engineering and information science writers.

v. **CSE** used by Biology, Chemistry, Geology and Physics.

https://www.plagiarism.org/article/what-is-citation

4. **Paraphrasing:** Paraphrasing is a process in which sentences are written with phrases and altered sentences without changing the main idea of the content. It is rewriting the sentences in your own words. People use quotes if exact words have to be written from the original text. Don't forget to write references and giving credit to the original writer.

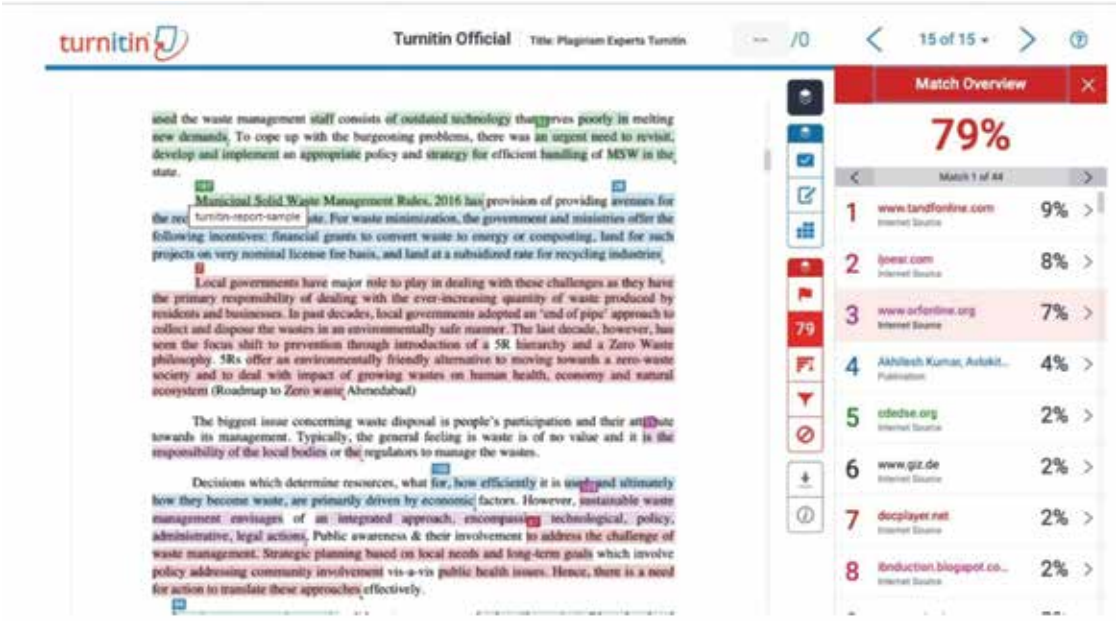
2.10.1.4 Ways of Detecting Plagiarism

1. The MHRD, Govt of India under the programme **"Shodh Shuddhi"** provides access to Plagiarism Detention Software (PDS) to all Higher Education Institutions.

   Link for the website: https://shodhshuddhi.inflibnet.ac.in/

2. Few websites are available to check plagiarism such as
   - Plagiarism checker- https://www.check-plagiarism.com/
   - Dupli checker- https://www.duplichecker.com/
   - Turnitin- https://www.turnitin.com/
   - Unicheck- https://unicheck.com/
   - PlagScan- https://www.plagscan.com/en/

Sample Report of Plagirism from Turnitin software



The report clearly shows 79% matching from different sources. The statements copied are marked with different colours. The report is created like this when the material or content passes through a check.

2.10.1.5 UGC Policy on Plagiarism

Plagiarism is regarded as a breakdown of academic freedom and journalistic ethics. The person doing plagiarism might have to face suspension, expulsion from school or employment. Penalties, fines and even jail may be imposed on such people.

Plagiarism is wrong, but it is sometimes unavoidable, hence there is a permissible plagiarism percentage. The UGC policy has led down four tiers to tackle plagiarism, which is "the practice of taking someone else' work or idea and passing them as one's own".

- According to this regulation, students and teachers who plagiarise will lose their registrations.
- The first tier, in which similarities upto 10% occur, would have no penalty.
- In the second tier, in which if 10% to 40% of a document is plagiarised, it would require students to submit a fresh manuscript and push faculty members to withdraw the plagiarised paper.
- If there is 40% to 60% plagiarism in the document, the student will be suspended for a year and that faculty member would surrender the annual pay rise and will not be allowed to supervise any student for two years.
- Enrollment or registration of the students with more than 60% plagiarized content in their thesis, would be cancelled and faculty members will not be allowed to supervise students for 3 years.

2.10.2 Fair Use

Fair Use allows for the use of copyrighted material. Fair use is a legal document that encourages freedom of expression by allowing the unauthorised use of copyright-protected work. It is the use of copyrighted content within certain parameters in order to avoid obtaining permission from the copyright owners.

A small amount of copyrighted work may be quoted for teaching, research, news reporting, and other purposes without obtaining permission from or paying the copyright holder. By its very nature, the objective of the use should not be commercial or geared to make a profit. Almost any comment or use that adds value to the copyright content without costing you money is usually considered appropriate.

When dealing with fair use, the nature of the copyrighted work comes into play. It is not acceptable to use particular terminology from the materials for personal gain.

2.10.2 1 The factors of Fair Use

Court would look for following factors stated in copyright law to determine the fair use:

1. **What is the purpose of the use and nature of use:** This includes whether it is commercial or educational in nature. Generally, courts see if the use is "transformative." To put it another way, courts see that if it contributes a new expression or addition to the original or it is simply a replica of the original copy.
2. **The copyrighted work's nature:** It is more likely to be fair to use things from factual works than totally fictitious works such as plays and films.
3. **How much the piece is used from the original piece of work:** Small amounts of material from an original work are more likely to be considered fair use than big amounts.
4. **The impact of the use on the copyrighted work's potential market or value:** The work that is going to affect the original potential market value and capability of the original product are less likely to come under Fair Use.

The most significant limitation on the copyright owner's exclusive right is fair use. It has been interpreted by the courts on several occasions by considering the economic impact of the use on the copyright; if the economic impact is minimal, the use may be considered fair dealing.

When determining fair use, the amount of material used and its final relevance can also be considered. It would be prohibited to use a major amount of the material, or possibly the entire item. Use what you need, but keep it short and to the point so you can go on to your own thoughts

2.11 Proprietary and Open-Source Software

2.11.1 Proprietary Software

2.11.1.1 Meaning and concept

Dictionary meaning of **Proprietary means "relating to an owner or company". It also means "marketed under and protected by a registered trade name".**

Proprietary Software is a software that is licensed by the owner. The owner has access to the source code that means source code of the proprietary software is not freely available. The source code reveals the main idea of how the software is developed and created. Source code tells the functioning of the software and how it is developed. It has coding in some computer language. The end user cannot tamper the software.

It is also known as closed source software. It limits the usage and distribution of the software.

2.11.1.2 Characteristics

Proprietary software have following characteristics:

- Proprietary software is property of the developer and is sold under few conditions.
- The source code is not freely available and the software is not sold with the source code.
- The license puts some restrictions on the users such as the number of computers to be installed, number of features allowed to use and restriction on sharing the software.
- For any changes to be done on the software, the users have to contact the developer or the company of the software.
- Proprietary software is not free of cost. The users have to pay for installing the software and using it.
- These softwares are unique and reliable.
- Proprietary software has proper license and copyright.

Few examples of Proprietary software are Microsoft Windows, Adobe Flash Player, iTunes, Google Earth, MacAfee, Adobe Photoshop, Skype, Oracle's version of Java and some versions of Unix etc.

These softwares are either purchased or downloaded from the internet. Few softwares are pre-installed when you buy a computer or laptop. The user cannot make any modification in the functioning and features of the software. Any tampering with the software can lead to legal proceedings.

2.11.1.3 Advantages of Proprietary Software

The advantages of Proprietary Software are as follows:

- **Security:** Proprietary Software is secure. It does not crash easily and is stable to use. Proprietary software is used for business purposes as they are more reliable.
- **Customer service:** It is the responsibility of the developer company to provide service in case of any damage or issue.
- **Originality and creativity:** Proprietary software maintains originality and invention of the developer.
- **User Interface:** Proprietary Software has good user interface as customers pay a fee to procure the software. User friendly software are more bought and find good place in the market.

2.11.2 Open Source Software

2.11.2.1 Meaning and concept

Open source means users can modify and share as its source is available. Open Source Software (OSS) is a software available with source code. Source code with the user means more freedom. Anyone with the source can modify, inspect and improve the software.

The idea of making source code freely available came from Richard Stallman, a programmer at MIT, who started an intellectual movement informally in 1983. Stallman thought that programmers should have access to software so that they may edit it in order to better understand, learn about, and improve it. Stallman began distributing free software under his own license called GNU Public License. The Open Source Initiative was founded in 1998 as a result of this new strategy and mindset surrounding software development.

2.11.2.2 Characteristics

Following are the characteristics of Open-Source Software

- Open source software is available for free.
- Developers can investigate how the code works and make changes to dysfunctional or problematic elements of the application to better suit their individual needs because open source is adaptable.
- Open source allows programmers to improve software by modifying existing code and even creating new ideas.
- Open source includes a built-in community that updates and improves the source code on a regular basis.
- For new programmers, open source gives excellent learning opportunities.

2.11.2.3 Open-source software examples

- LibreOffice.
- GNU/Linux.
- VLC Media Player is a free media player.
- Mozilla Firefox is a web browser.
- GIMP, VNC, and the Apache web server
- jQuery.
- MOODLE
- WordPress (Content Management System)

2.11.2.4 Advantages of Open-Source Software

Advantages of Open-Source Software are as follows:

- **Adaptability:** Users can customise the programme to meet their own requirements. Additional features can also be added by the user. On the other side, the unneeded features can be removed.
- **Cost:** Open Source Software is generally free of cost or charge is minimal. Therefore, they are easily affordable.
- **Less restrictions:** Restrictions on distribution and sharing of the software are less. Less restrictions are imposed on the number of times it is downloaded.

- **Digital transformation:** People are becoming more digitally advanced with the help of Open-Source Software. Digital transformation can be easy if more people have accessibility to the software required.
- **Career growth:** People learn various software to excel in their career. Open-Source Software such as typing tutor helps mastering typing skills among youngsters to gain a better career opportunity.

2.11.3 Difference between Open Source Software and Proprietary Software

Following are few differences between Open Source Software and Proprietary Software

Open Source Software	Proprietary Software
• Licensing and usage fees are minimal or non-existent.	• The price is determined by the size of the software.
• It is completely customisable, however it is subject to the terms of the open source licence.	• Requests for changes must be made to the software vendor. Bug fixes, new features, and refinements are all included.
• Open Source Software is less user-friendly, but this might vary depending on the project's goals and people who manage it.	• In most cases, it is more user-friendly. Adoption and user experience are important concerns when developing a profit product.
• New features or enhancements if required, the user can develop it.	• The software owner must be contacted for adding the enhancement and new features.

However, proprietary software should be licensed and protected through restrictions that make its usage limited but educationists are recommended to develop open-source software to make it available for all.

Points to Remember

- NTeQ Model is an approach of integrating technology by the means of computer in a lesson plan.
- It promotes higher order thinking.
- It encourages multiple activities in an multi-dimensional environment.
- NTeQ Model is not designed to implement in every lesson.
- The procedure which is initiated before the permission and regulating checks occurs to run an application is Authentication.
- The person can be authenticated by Know, have and has/are with the of credentials.
- Authentication is required to adhere legal rules and regulations, follow ethics established by Government and for safety of personal information. To protect sensitive data and to secure information and evidences.
- This unit covers various benefits of authenticating to safeguard documents, data and private information besides confidential dossiers.
- There are various ways by which one can authenticate ICT resources such as multi-factor authentication and security, single factor security, two-factor security etc.
- ICT-based teaching-learning approaches in schools is indispensable due to its utility in the

education. ICT has also become essential to the teaching-learning interaction, through such approaches as replacing chalkboards with work together digital whiteboards, using students' own smartphones or other devices for teaching during class time, and the "flipped classroom" model where students viewpoint lectures at home on the computer and use schoolroom time for more collaborative trainings.

- ICT influence teaching and learning in many ways such as its effective use especially in distinct, pair and group work with computers, can lead to better-quality classroom discipline and improved management of learning, project based learning, problem-solving learning etc., are supported by ICT for accomplishment of task assigned to students.
- E-Learning, M-learning, teleconferencing, interactive multi-media learning, and web-based training are various types of Technology based Learning Environment
- Paradigm shift in both content and Pedagogy includes designs for teaching – learning in schools categorized under Teaching Approaches such as active learning, collaborative learning, Creative learning, Integrative learning, and evaluative learning.
- The direct and indirect/guided approaches are the ICT Based Teaching-Learning Approaches that are also known as expository method and exploratory method respectively.
- Teacher-Student Centered Teaching-learning begins with Exposition and through inquisition leads to generalization. The Approaches that are ICT based they are further classified as hi-tech and low-tech approaches.
- Key Teaching Techniques based on Modern and ICT Based Teaching Methods
- Key Teaching Techniques based on Modern and ICT Based Teaching Methods are Flipped Classrooms, Design Thinking and Creative Ideas, Mind Maps, Gamification, Free online Learning Tools, ICT Based Teaching Methods, Learning Management system & Massive Open online courses
- Highlighting integration of ICT for enhancing teaching learning approach means Digital culture and digital literacy -the abilities of searching for, discriminating, and producing information, as well as the critical practice of new media for full contribution in society—has thus become an imperative consideration for curriculum context.
- ICT enabled tools for teaching-learning Process have numerous advantages, which helps not only students but also teachers to designing, developing and executing instructional material. To promote collaborative learning, inquiry based, problem based, project based learning it has an additional advantage.
- For Professional Development Teachers need to practice simulated classroom settings where they accept the role of students and solve problems by using the computer as a tool.
- Content designed and developed for students, and the primary locus of learning is the classroom when audio-based teaching takes place. It can be executed by the means of radio transmissions; Interactive Radio Instruction (IRI); one- and two-way audio instruction; and, progressively, podcasts.
- Television used as an education mode on condition, which has high-quality content and instructional techniques for prospective, in-service, and on-going teacher education. When connected to Internet directly or from end to end set-top boxes, Blu-ray players, and game supports is known as **Internet Protocol Television (IPTV)**

- Phone-based audio conferencing permits multiple parties of instructors to connect using either an audio-conferencing bridge system or peripheral conferencing providers.
- The learning that takes place through small, mobile networked devices—cell phones, smart headsets, personal digital assistants (PDAs), tablets, and handy media players is known as M- or U-learning basically includes e-learning.
- Videoconferencing also referead as video-teleconferencing is a set of interactive technologies that permit individuals in two or more sites to interact via full-motion, two-way video, and audio broadcasts simultaneously.
- Models of ICT-Based Education includes Correspondence model, Audio-based models, Televisual models, Computer-based multimedia models, Web-based and mobile based models.
- NteQ means for iNtegrating Technology for inQuiry. It's determination is to use the computer as an assimilated tool within the classroom.
- According to Morrison and Lowther, 2005. This model has 10-step methodology which includes *Specify Objectives or aims, Computer Functions, Specify Problem (difficulty), Data Manipulation (management), Results Presentation (demonstration), Activities During(while using), Before using and After using Computer, Supporting (assisting) Activities, and Assessment (for evaluation).*
- NTeQ model lesson plan is designed by considering the above ten steps.
- For the Assessment and evaluation a rule book or Rubric is designed and developed.
- Digital materials need to be attentively quarried, prepared, and archived properly. We refer to this procedure as digital curation.
- Digital curation is a process of five Cs: Circulation, Conceptualization, Critiquing, Categorization, Collection
- Curation follows the prescribed steps selecting, creating, organizing, archiving, communicating, sustaining, deleting, storing, annotating, evaluating.
- Core competencies of curators lies within the preservation, research, and communication.
- Tools for curation of digital resources are Flip boards, Storyful, RebelMouse, Magnify, Summify,Egentia, Shareist, Pluggio, KBucket, FlashIssue, ContentGems, Pocket, Lino, Flickr, Skitch, Sutori, Bulb, Dropbox, Wakelet, Google Sites, Paper.li , WordPress, Scoop.it!, Feedly, Evernote Web Clipper, Pinterest, curate, pearltrees, Diigo, ZEEF, LiveBinders, trap!t, 3dIssue, flockler, Kirby, BagTheWeb, Aggregage, Listly, Weje,Choosito, Mural, Symbaloo, Smithsonian Learning Lab, Artsonia Kids Art Museum etc.
- Digital Gap, Attitude, Financial, Skills, Exercise Time are the challenges that anyone can face while preserving the digital.
- Technologies (Digital Tools) for Teaching and Learning are Instructional Tools, Content Development Tools, Social Tools, Personal & Professional tools, Google Tools
- SAKSHAT is a One Stop Education Portal, the pilot project was launched on October 30, 2006 to facilitate lifelong learning for all and provide an opportunity for those engaged in earning.
- Sakshat caters to facilitate the learning needs of various learners from class I to PG. It contains links to various e learning platforms such as Swayam, Swayamprabha, e Yantra, Samarth, Virtual Labs, Spoken Tutorials, Baadal, Shodh Shudhhi, e pathshala, FOSSEE and so on.

- Swayam was designed to achieve the three principles of Education Policy, ie., access, equity and quality.
- Swayam platform hosts courses from class 9 to postgraduate level that can be accessed by anyone anytime and anywhere.
- The courses hosted on SWAYAM are in 4 quadrants: Video Lecture, e content, discussion forms and assessment.
- In order to ensure that best quality content is produced and delivered, nine National Coordinators have been appointed for Swayam.
- Digital storytelling is an art of integrating media tool, graphics, animations, audio, texts and other computer based techniques in a story. It is basically a computer based technique of telling stories.
- Digital stories promotes critical thinking as it gives chance to understand the topic from many corners with animations, graphics and sound making it more relatable and connected.
- Process of creating digital story includes selecting a topic, map the content, give a title, plan the story, the visuals and the images. After that, create images/animations/gifs files. At last, create the audio files and set the story.
- Animoto, canva, toontastic and we video are few good tools of creating digital stories.
- Story boarding is a systematic and sequential arrangement of visual/images of a story along with script.
- Storyboard when used as a teaching strategy gives a chance to students to be innovative designers and effective communicators. Students learn to identify gaps and holes that could be in the final digital story or project.
- Storyboarding is scene by scene visualisation of the entire Story to be shot.
- Cyber crimes can be any crime related to illegal acts done through computer such as illegal online theft, hacking someone's account, making duplicate social media account in somebody else's name and sending absurd messages etc.
- Thefts, data breaching, harassment, trafficking, abuse and threatening, stalking are illegal activities committed through technology with the use of internet.
- Some of the implications of cyber crimes are financial and non financial implications.
- **Software piracy** is an illegal act of copying and distributing software without the permission of the owner. It is transferring and sharing the software without a license.
- In India, **The Copyright Act 1957**, is the main statute for all copyright-related laws and it was enacted to address copyright and copyright infringement problems.
- Copyright is one mechanism for preventing piracy of a person's intellectual property.
- The Act expressly states that any act carried out by an unauthorised person with software that was legal for the authorised licensee to carry out will result in civil remedies such as injunctions, damages, and other administrative measures by administrative authorities to protect copyrighted software.
- The Amendment in the Act also provides criminal remedies, such as penalties for copyright infringement Section 63B of the Act stipulates a minimum sentence of 7 days, which can be increased to a maximum of 3 years, as well as a fine of up to 15,000 which can be increased to 2 lakhs at the judge's discretion.

- Plagiarism happens when you use other's work without giving credit to the original creator.
- Plagiarism can be intentional or unintentional.
- Plagiarism can be avoided by paraphrasing, citations, using quotation marks and summarising the content.
- Few software can be used to detect the percent plagiarism.
- UGC has brought down norms regarding plagiarism in the regulation 2018, that states only 10% plagiarism is not punishable.
- Fair Use allows for the use of copyrighted material under some factors.
- Four factors such as the nature of material copied, extent to which content is taken from the original work, the impact on the commercial market and nature of copyrighted work decides whether it is fair use or not.
- Proprietary Software is a software that is licensed by the owner. The owner has access to the source code means source code of proprietary software is not freely available.
- Examples of Proprietary software are Microsoft Windows, Google Earth, MacAfee, Adobe Photoshop, Skype, iTunes, Oracle's version of Java and some versions of Unix etc.
- Proprietary Software has a good user interface as customers pay a fee to procure the software.
- Open Source Software (OSS) is software available with source code. Source code with the user means more freedom. Anyone with the source can modify, inspect and improve the software.
- Open-source software examples are LibreOffice, GNU/Linux, VLC Media Player is a free media player, Mozilla Firefox etc.

UNIT-3

ICT for Evaluation, Documentation and Administration

UNIT-3

UNIT 3: ICT for Evaluation, Documentation and Administration

Learning Objectives:

- To develop an understanding of the software tools for evaluation in education.
- ICT tools improved mastery of contents and attitudes towards teaching.
- Improved education literacy in parents, teachers and students.
- Outcomes improved attitudes about leaning, acquisition of new skills needed for the education
- Essential components for ICT implementation in administration
- The role of ICT in the vital areas of administration.
- Effective measures for the implementation of ICT in administration.

3.1 Introduction:

ICT stands for 'Information Communication Technology'. Daily use of digital technology includes using a computer, tablet or mobile phone, sending email, browsing the Internet, making a video call - these are all examples of using basic ICT skills and technology to communicate. ICT facilitates the use of new educational resources and the revitalization of learning methods, establishes effective student collaboration and simultaneous access to technical information. It is much easier for them to build team projects, collaborate and learn from each other. The career and information technology Information and Communication Technologies (ICT) prepare students for the digital workplace by equipping them with high demand, high salary skills and skills that will enable them to become leaders in their chosen careers. ICT supports the development and improvement of information delivery. The World Wide Web can show that ICT can lead to improved student learning and better teaching methods. For example the use of multimedia, computer, internet, tab, smartphone etc. ICT plays an important role in student assessment. ICT is an educational institution because all educational information can be safely stored through ICT. ICT helps teachers to communicate effectively with their students. So ICT closes the gap between teacher and students. Information communication technology can help to improve the quality of education by increasing the motivation and involvement of students and by facilitating the acquisition of basic skills and also by improving teacher training. ICT is also a transformational tool which helps in encouraging transition to a student-centered environment. ICT facilitates the use of new educational resources and the revitalization of learning methods, establishes effective student collaboration and simultaneous access to technical information. It is much easier for them to build team projects, collaborate and learn from each other. ICT in higher education is not only used for research and educational activities but also for the development of online learning materials; deliver content for reading and sharing content with remote readers; communication between students, teachers and the outside world; construction and presentation of presentations and presentations.

3.2 ICT Scope and Techniques of Evaluation:

- **Mass education:** There has been an increase in population and knowledge. There is therefore a need to educate the masses. The problem is also compounded by the large number of illiterate people. Therefore, ICT has a huge role to play in educating the masses and transferring large amounts of information in a timely manner. In this regard, social media platforms such as TV, radio, and other modern technologies such as computers and information technology (E-mail, Internet, mobile phone, etc.) have a wide range.

- **Expensive and risky tests:** In many fields of science and technology there are some tests that have a positive effect on effective learning that the teacher is not recommended to do in the classroom because of the cost and health risks involved. Such tests, if done carefully in a laboratory or elsewhere, can be recorded with the help of new information and communication technologies and used by teachers and students in effective learning.

- **Games and simulations:** If expensive or dangerous historical events could not be solved, ICT can free us by doing the same through imitation. Computer technology in this case plays a major role. This can provide a real 3D image of three-dimensional (3D) events. It may also reflect the function of different parts of the event and the results. Another possibility is games. Children can learn, through play, many concepts that cannot be taught in a formal classroom. Play and participation have a wide variety of training for military personnel and the aviation industry.

- **Primary education:** ICT has a comprehensive primary education program and an open school program. Today there is a great need for staff training and general education to improve themselves in the workplace. In this regard, the grad programs, the informal education system, have acquired a new position. Educational technologies and their new procedures can teach students who are unable to come to the classroom to receive their education. In this regard, formal learning materials, modules, communication systems, and mentoring are some of the new things that can help students move.

- **Collection, storage and retrieval of information:** There are digital cameras and cell phones that give us the ability to capture similar situations. There are also satellite operators around the clock to provide us with information on areas we can reach. Information can be collected with the help of this new electronic technology in both audio and video format. Such information can be easily stored in magnets and electronic devices and can be accessed quickly.

- **Research:** As mentioned earlier, information can be collected and stored for educational purposes. Information can also be collected and stored in the same way for research. In addition, for analysis and reporting, a computer can be used. Not only quantitative data but also quality data can be analyzed and there is a computer role as well as a variety of methods and methods for data analysis. With the use of the Internet, the Web, and INFLIBNET, researchers and students who want to inquire or find out what's going on elsewhere can access a large amount of information sitting at home. He can create his own ideas, problems, and ideas and solve them at home. In this program, research findings are not only distributed but also the quality of research can be enhanced.

3.2.1 ICT: Techniques of Evaluation

Innovation performs a big component in assessing compelling and effective learning. Present day innovation gives instructors an extensive assortment of gadgets that can be applied within the look at corridor. Innovation can assist teachers with evaluating their understudies' mastering and execution inside the study corridor. The usage of ICT in appraisal remembers the usage of superior hardware to assist for the advent, conveyance, stockpiling or saying of understudy appraisal assignments, replies, imprints or input. ICT-primarily based checking out can utilize an collection of configurations, together with text or text designs, interactive media preparations like sound, video or photographs; may additionally comprise complex reproductions or games. It must likewise be possible by understudies in gatherings or completely and is attainable with countless understudies in a steady or offbeat manner.

Educators can utilize the PC to do their exams. Teachers can utilize PCs to make their own appraisal assignments, deliver those errands to certified understudies, and document and supply input and grades to those understudies. PCs can likewise be utilized to investigate understudies reactions, both to give input to the understudy at the present and importance of their response and to present grievances to the educator on whether the undertaking needs to be feasible.

Figure 3.1: ICT Tools

3.2.2 Tools for Assessing Objective Items

Technology used learning settings prompted educators to use PC in students' assessment. Computer-based assessment (CBA) could also be treated because of the use of digital technology to gather, process, and report the results of assessment.

The four components of CBA may be categorized as

1. Assessment Generation
2. Assessment Distribution
3. Assessment Scoring and Interpretation
4. Storage, Retrieval and Transmission.

- **Objective type questions:**

The measure varied forms of objective kind queries like multiple-choice, fill-in-the blank, multiple response and text box. The format of every kind of objective things is elaborated below:

i. Multiple-choice question kind

A question with 3 or four choices is given wherever just one choice is correct. Choices are often text, pictures or a mixture of each. It consists of our elements as given below:

- STEM - question or incomplete statement
- OPTIONS - instructed answers or completions
- DISTRACTORS - incorrect responses
- KEY - correct response

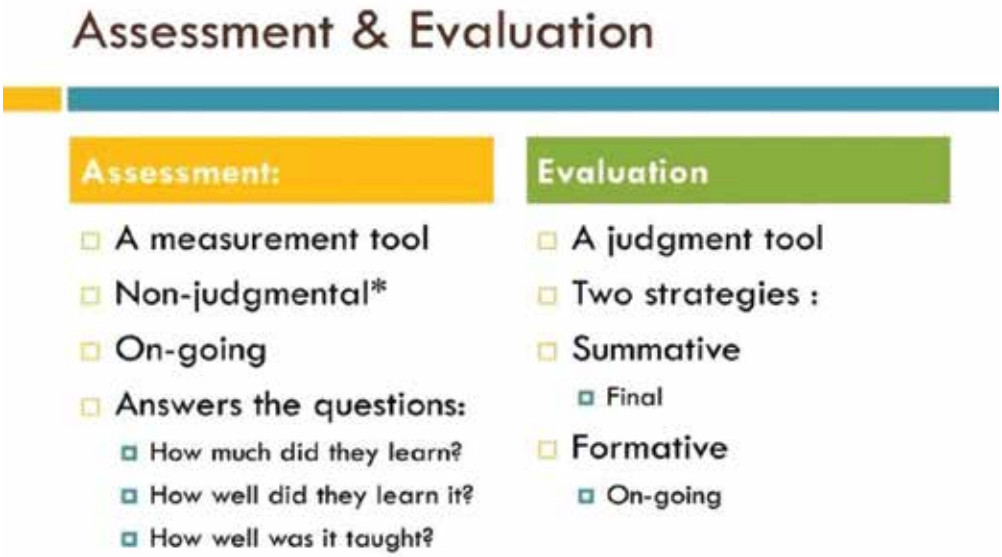
The full list of presentation choice in multiple-choice kind question is:

- Vertical choice Button
- Vertical choice Button (with 'other' text box)
- Horizontal choice Button
- Dropdown list (text only)

The question setter may also set the order that the choices square measure displayed in:

- Display Order- All the choices square measure displayed either in vertical manner or horizontal manner.
- Alphabetic –This choice mechanically finds the solution selections or rows in alphabetical order.

Quizzes



There is different programming that may be utilized to assess goal test matters as tests. Quizzes which are led in the direction of the end of the module (for instance are 'summative') are alluded to as e-checks; exams that are intended to assist understudies with checking their knowledge and distinguish regions to zero in on are alluded to as developmental.

Tests have diverse capability benefits, for example, follows:-

Between scorer unwavering pleasant (the dependability and internal consistency amongst at least human beings) - It offers a score of ways tons of homogeneity there is inside the appraisals given by way of diverse raters. Tests are checked impartially by using a PC. Speeds of stamping for tests - Results are accessible quickly without manual work force checking.

Adaptable arrangement of complaint - Feedback might be given each at man or woman inquiry level for proper and wrong reactions, and through and massive for the take a look at in well known.

Reports - Each query may be investigated by way of a naturally produced document empowering analysts to test for any errors.

Re-usable inquiries - An inquiry financial institution may be advanced and check things can be introduced and eliminated. Questions and answers may be randomized.

3.3 Software Tools for Evaluation in ICT:

ICT instruments represent Information Communication Technology gear. The ICT instruments means to advanced frameworks like PCs, workstations, printers, scanners, programming program bundles, realities projectors, and intelligent instructing field.

The ICT gadgets are the contemporary devices, ideas and techniques used in researcher- to-teacher, understudy to-researcher connection for instance: - clicker gadgets, cell bundles, flipped address space for realities and verbal trade innovation.

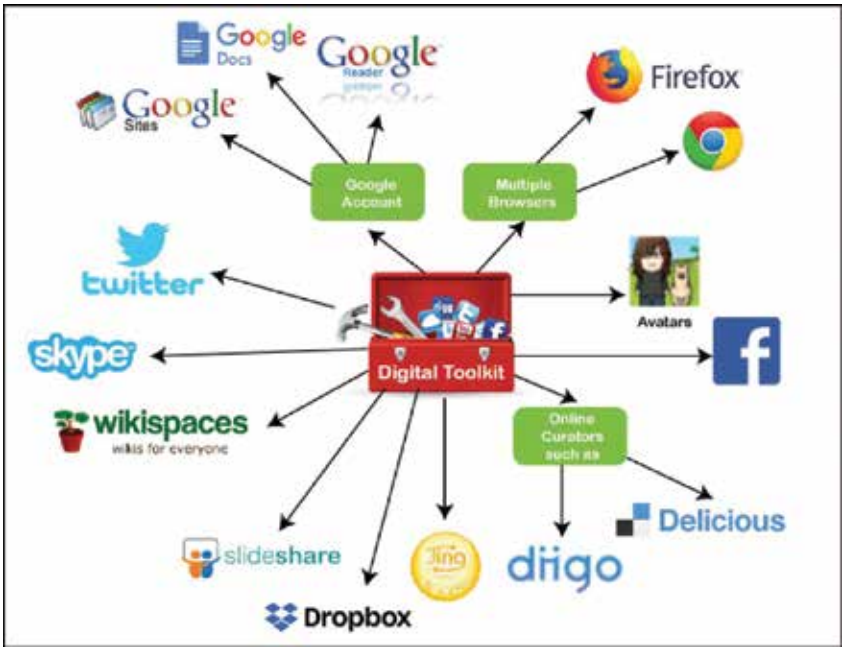


Figure 3.2 Software tools for evaluation

Pros of ICT Tools:

Some benefits of ICT Tools:

1. Teachers are capable of training higher with audios, graphics, video and graphics.
2. Teachers are able to create well-designed and interactive lecture room activities.
3. It is used to provide higher coaching and studying methods
4. To unfold, focus approximately on the technological effect on social alternatives in education.
5. It is used to promote and enhance the virtual subculture in colleges, universities, and schools.
6. Automated answers to paper-primarily based totally guide techniques and processes.

Cons/Disadvantages of ICT Tools

Disadvantages of are ICT tools given below:

1. **Unemployment:** -Even supposing it is created a business arrangement, it is created a shortage and a little continent employed. firms will get profit by victimizing computers in situ of humans: as a result worker loses their jobs as a result of they're not required.
2. **Lack of Security / Privacy: -** It is modified and will be easier, it is additionally raised problems with privacy and security. The advancement of individual square measure involved that private information could become public information. Modification is continuous virtually daily implies that so as to secure their jobs, everybody should have the newest IT data. Dangers of PC viruses, trojans, spam, phishing, and malware.
3. **Cyber bullying: -** On social media pages, it is currently abundant, easier to harass and harass others because it is far easier for net users round the world. they do not see the results of reading / listening to hostile concepts. There are numerous investigatory cases involving cyber bullying with doubtless fatal consequences within the past.
4. **Reliance on Technology: -** People have no trouble browsing, writing, or counting while not using computers which leads to loss of handwriting skills (why write if not used for spell checking). Count while not reckoning even very little further, browsing books (why read if there's a great deal of data online).
5. **Social Networking: -** Most of the Children, nowadays spent more of their time on social networking sites which hampers their studies, they spent more time on computers and do not play outdoor games which interns hamper their social and emotional behaviour. Playing violent games like PUBG, they will become violent.
6. **Preparation Time: -** Preparation takes longer for the web to be used effectively in education. In addition to planning online-based programs, we must always explore the web to transfer lesson plans and tailor them to support course objectives or visit sites to pick out the acceptable locations for needed categories.

3.3.1. Developing Literacy using ICT Tools :

Various tools for developing literacy are given below:

- **Graphics and Drawing Programs: -** Today visual literacy is as widespread as ever. Imagine a way for our college students to use the type of drawing or photo package for our college students. If you want to use it creatively, to feature a picture in a newspaper article, to identify how a thousand phrases can be repeatedly represented by colors, photographs or gestures, use the medium.
- **Web Designing and Creation :-** Actually, they are web phrase processors. So the opportunities in literacy classes are endless, although the teacher's abilities in ICT can be curtailed.
- **Digital Video:-** The use of digital video to help enhance the language talent of college students.
- **Email:-** Emails are satisfactory for the growing talent in online literacy. We all write otherwise on line as well as for exceptional audiences.
- **Web Search:-** Ability to trace records is an essential competency in the twenty first century. What are the techniques for navigating the net and digital text? What are leads and signposts?
- **Wiki:-** It can be a repository of understanding for scholars and the opportunities for blog as well as wiki are wide.
- **Word Processing:-** Use of Word processing is associated with the improvement of literacy and language.
- **Blog:-** Blog is a great technology for newbie's to connect and speak using an internet phrase processor.

3.3.2. ICT Tools in Early Childhood Education for Literacy and Development

The goal of ICT tools is the most common education for children's teachers. We can use ICT tools to promote literacy and the development of literacy and numeracy. It is mostly programmed on computers in collaboration with other children, where the quality of the conversation can be very interesting. Various ICT tools to promote literacy and language development in children's education are given below:

1. Word processors
2. PC/Computers
3. The Internet
4. Appropriate programs for development

1. **Word Processor:-** This gives children the opportunity to create and write without having to learn to build character by hand. ICT learning tools for children's education provide many such options for children and pictures. With the help of video we can improve our literacy and language skills. This is the first activity as it enables children to knit pictures and words together.

2. **Computers:-** To your children, computer systems offer a 'print-wealthy' studying environment. We are going to in all likelihood find that there's a more attention to element in their interactions than in other situations.

3. **Internet:-** Internet is the best learning tool for our world. With the help of internet, children can easily learn literacy skills in their home language and in the language of their friends.

4. **Appropriate Development Plans:-** There are certain things to be kept in mind while selecting the most suitable development programmes. We should look for programs that encourage reading, writing, speaking and listening. Various apps can record children's voices, for example, the Gruffalo app, With the Gruffalo app, kids can record their own voices later in the story. During the story they can hear their voice as it is being told.

3.3.3. ICT Tools for Primary Schools

There are various ICT tools for primary schools:

1. Spreadsheets
2. Presentation software
3. Blogging
4. Information literacy skills
5. Animation
6. Publishing programs
7. Web 2.0
8. Making a video

1. **Spreadsheets:-** Spreadsheets are like a word processor, in which we can save texts and have enough typing skills. Basic exit skills include the ability to set columns, apply basic formulas, insert and delete rows, change font size, etc.

2. **Introductory Software:-** We can use PowerPoint or Prezi, no matter what, we like and are most familiar with. Make sure by the end of elementary school, students come out with skills such as creating handouts and notes, setting motion pictures, designing their slide designs, drawing and input tables, and clever artwork.

3. **Blogging:-** Most blogs are interactive and allow students to have a controlled online presence, or Blogging is the part of a website or type of website which can be used for updating periodically with new content.

4. **Literacy Skills:-** Web search is an important skill for literacy. Students must understand key skills and practical skills for the understanding of domain names and their meaning, in order to understand which ones are most reliable, knowing which information and research is most useful.

5. **Animation:-** IT is a great tool for students to practice, and can develop the story and develop their high-level skills through planning, monitoring and evaluation of their work.

6. **Publishing Programs:-** The most common of these is the MS publisher, which is very good at developing literacy skills which makes it useful for primary education.

7. **Web 2.0:-** One of the best ways for students to develop high quality skills. Includes Face book, Twitter, where we can create a classroom page, and Tumblr, suitable for digital images with a short title.

8. **Video Making: -** Because most iPods include a recorded camera, students can make video, edit video and view video. Students can transfer a video where their work can continue to be put together.

3.3.4. ICT Tools for Quizzing/Testing/Gaming

There are various ICT tools for Quizzing/Testing/Gaming:

S.No	Name of the Tool	Description of the Tool
1.	Book Widgets	Book Widgets is used for multi-touch books, games, worksheets and simulation and classrooms.
2.	Gimkit	Gimkit is an ICT device for gaming in which college students can earn with the aid of efficiently answering the questions. By gambling an interactive game, they could make investments with their money.
3.	Class tools	The ICT class tools incorporates diverse forms of class tools.
4.	Genial.ly	Genial.ly device is used for making interactive content material that your target market loves. Bring your content material to life, train and attract.
5.	Google forms	Google bureaucracy with the assist of the Google shape quizzes, reviews may be completed so easily. Courtesy: https://www.slideshare.net/caskeyd/google-docs-3008413
6.	Class marker	Class marker With the assist of classmarker, on-line checking out may be completed easily. Courtesy:https://www.slideshare.net/201011109/classmarker-13596349
8.	Flip grid	The Flipgrid ICT device makes a grid this is your classroom.
9.	Deck Toys	Deck Toys, in order to spark the debate, upload a topic. To ignite a dialogue, your college students percentage a brief video response. Super straightforward.

10.	Formative	The formative ICT device is used to create formative reviews in addition to performing on college students' insights in real-time.
11.	Educa play	Educaplay is used to make thrilling video games that could supply on the spontaneous feedback.
12.	Flubaroo	With the assist of the Flubaroo device, we will examine and examine the work/development of the scholars on-line
14.	Plickers	Plickers is an ICT device that permits instructors to accumulate statistics from real-time formative assessment without the want for pupil equipment.
15.	MasteryConnect	With the assist of the MasteryConnect, we will pick out the stages of comprehension, development mastering and instruction, and goal college students for intervention.
16.	Lightsail	Lightsail is used for formal checking out; with the aid of using the usage of the Lightsail device we will beautify the improvement of literacy and sell a love of reading.
17.	H5P	H5P is used to create, reuse and percentage interactive HTML content material to your browser.
18.	Kahoot	It is used for motivational and interactive quizzes. https://www.slideshare.net/camilaabrito1/kahoot-presentation-1
19.	JeopardyLabs	With the assistance of this device, we will create a custom designed jeopardy template without the usage of PowerPoint.

3.3.5 ICT Tool for Presentation:

There are various types of an ICT tool for presentation:

S.No	Name of the Tool	Description of the Tool
1.	SlideShare	Slideshare is used for the entirety. You need to recognize and love through presentations, documents, infographics, etc.
2.	Buncee	Fun to examine your production and presentation tools
3.	Prezi	With the assist of the Prezi, we are able to create a web slideshow.

4.	Prowise	Using Prowise, we are able to construct a getting to know surroundings in our faculties this is greater inspiring and attractive and elevates collaboration.
5.	Google Slides	With the assist of the Google slides, we are able to paintings at the equal presentation simultaneously.
6.	Nearpod	Nearpod Create slideshows which are interactive the usage of quizzes, images, textual content and questions.
7.	Peardeck	By the usage of Peardeck, we are able to create interactive presentations, training, and exams to interact every student.
8.	Sutori	With the assist of the Sutori, we are able to make a presentation for the study room in a completely unique timeline format.
9.	Lesson up	Lesson up is used to make virtual training which are amusing and attractive.
10.	Mentimeter	Using students' enter to create pics in an instant.

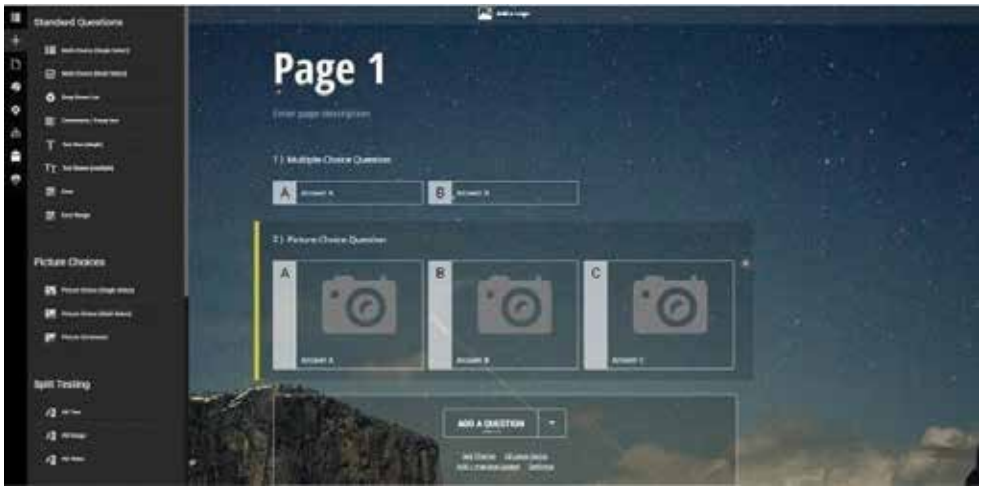
3.3.6. ICT Tool for Lesson Series:

There are various ICT tools for lesson series:

S.No	Name of the Tool	Description of the Tool
1.	Gooru	Gooru is an ICT device that gives college students virtual content, unfastened tools, and records to very own their mastering.
2.	BookWidgets	Worksheets, games, simulations, etc., in lecture rooms and multi-contact books.
3.	GoConqr	With the assist of the GoConqr ICT device, we are able to make our very own mastering surroundings with entry to to over 1,000,000 crowd-sourced resources.
4.	ReadWriteThink	ReadWriteThink gives unfastened get entry to right nice substances for studying and language arts practise to afterschool professionals, mother and father and educators.
5.	Showbie	Showbie is the easiest, an powerful and quickest app for challenge and remarks on its school room device.
6.	TesTeach	is used to create virtual lessons.

3.4 ICT Resources for implementing and Constructing ICT based Tests/Quizzes:

Assessment related to the usage of records and verbal exchange technologies (ICT). ICT may be used (a)

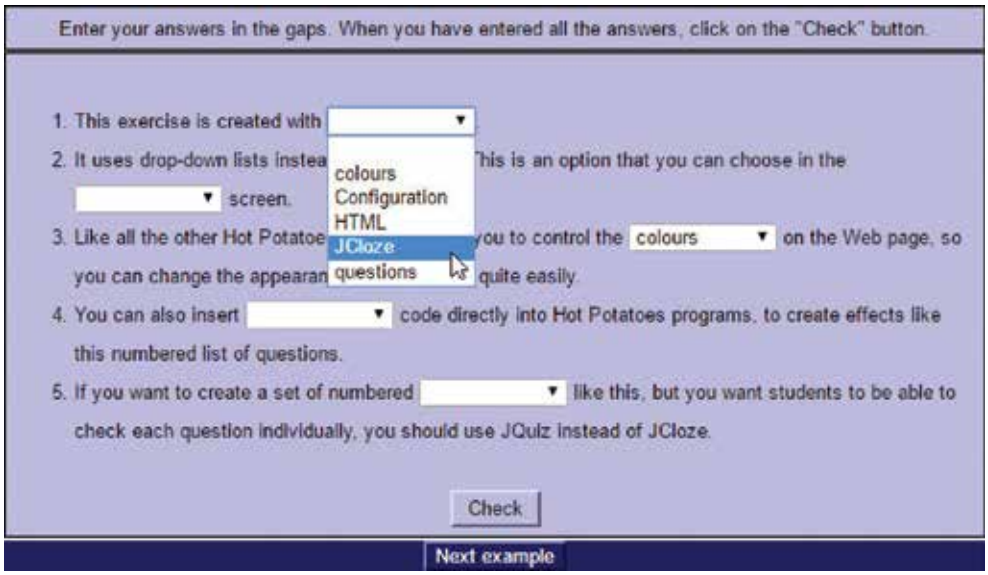


to supply conventional evaluation code extra successfully and efficiently, and to alternate the manner Competencies are assessed and increase code that facilitate the evaluation of competences which have been tough to seize with conventional evaluation code. [13]ICT may be used to increase checks which includes laptop-primarily based totally checks (regularly a virtual model of the conventional paper-primarily based totally checks), laptop adaptive checks (e.g. capable of alternate their shape in reaction to the enter from the learner being tested), and test-introduction applications. ICT-primarily based total checks may additionally comprise simulation, interactivity and built reaction code.

3.4.1. Online Quiz Makers & Test Creators:

There are various ICT resources for Quiz and Test construction and implementations:

1. **ProProfs Quiz Maker**



Pro Professor Solutions helps you write quizzes, safe tests, and student/staff assessments. ProProfs Quiz Maker is a cloud-based quizzing software for creating and delivering online quizzes, exams and tests. It comes with complimentary test templates, automated grading and integration with Pro Professors LMS. It allows us to test using existing templates or create your own from scratch. User-friendly drag-and-drop interface for creating online quizzes and tests. You can save time with automatic grading.

2. Free Online Surveys

The Free Online Surveys is a popular tool for quiz maker and quickly create an online survey, generate online polls, and generate forms using a form generator.

Features:

- Create surveys, online quizzes, or paperwork fast and without difficulty using the drag-and-drop builder or query prediction tool.
- Easy delivery (e-mail to customers, put a short URL, QR code, a short piece of code on your website, etc.).
- Automatic scoring for quizzes and all results compiled into stunning charts and graphs.
- Theme Customization - easily add pictures, movies and text fields.
- Create custom messages primarily to expose quiz takers based solely on their web page and overall score.
- Filter and test notification sets, and create custom reviews and share virtual reviews with easy URLs.
- Question types for the quiz: Multiple choice (single and multiple selection), drop-down list, text/ comment box, dates, picture-choice questions.
- Question types for surveys and forms: All of the above, Opinion Scale, Net Promoter Score, Star Rating, Order Ranking, Slider, Matrix, AB Test (Text, Images and Video), Contact Form.

3. Easy Test Maker

Easy Test Maker is any other on-line check maker that helps us to create and manipulate quizzes. Easy Test Maker offers the gear to layout a couple of query sorts, print change variations, and put up to the web. Online checks are mechanically graded.

Features:

- Create a couple of choice, fill-in-the-blank, matching, brief solution and real or fake questions on your on-line quizzes. Add commands and divide your check into a couple of sections.
- Published and checked are graded marks. We can view and print students' consequences and override grading while necessary.
- Alternate variations and solution sheets to lessen cheating. Questions and solution alternatives are mechanically shuffled in a special order.
- Use Question pools (randomly decided on query sets) and Create an examination out of your

present checks, replicate a query from one check to any other.

- Built-in spell test removes unintentional misspellings and typos while the using the quiz maker.
- All query sorts, multiple sections and Answer sheets are available.
- 25 check limit

4. Hot Potatoes

Hot Potatoes is a set of six authoring equipment and advanced through the Research & Development branch of the University of Victoria Humanities Computing and Media Centre. Tools mainly assist to create interactive on-line sporting activities and quizzes. It seems easy at the start glance, however you don't have to recognise any XHTML or JavaScript at the user level, users just input your data – texts, questions, answers – and there you go. It is totally free and open source software.

	A	B	C	D	E	F	G	H	K	L
1	Summary:									
2	Points Possible	4								
3	Average Points	2.18								
4	Counted Submissions	11								
5	Number of Low Scoring Questions	2								
6										
7	Submission Time	First Name	Last Name	Your Email Address	Total Points	Percent	Times Submitted	Emailed Grade?	Sacramento, the capital of California, w...	What is the capital of Louisiana?
8	3/28/2011	Johnny	Begood	jb@nosuchmail.com	3	75.00%	1		1	0
9	3/28/2011	Sally	Student	ss@nosuchmail.com	3	75.00%	1		0	1
10	3/28/2011	Lisa	Simpson	ls@nosuchmail.com	4	100.00%	1		1	1
11	3/28/2011	Ralph	Wiggam	what's an email?	0	0.00%	1		0	0
12	3/28/2011	Polly	Pocket	pocket@nosuchmail.com	1	25.00%	1		0	1
13	3/28/2011	Max	Power	mp@nosuchmail.com	1	25.00%	1		0	0
14	3/28/2011	Jason	Climber	jcl@nosuchmail.com	3	75.00%	1		1	1
15	3/28/2011	Billy	Jo-Bob	jobob@schoolmail.com	2	50.00%	1		0	1
16	3/28/2011	Patty	Paterson	pattyp@nosuchmail.com	2	50.00%	1		0	0
17	3/28/2011	Maggie	Simpson	miss@nosuchmail.com	1	25.00%	1		0	0
18	3/28/2011	Tom	Thumb	tt@schoolmail.com	4	100.00%	1		1	1
19										
20									36.36	54.54

Features:

- Mixed query sorts in a quiz. Use multiple-choice, short-solution and other "hybrid" shorts.
- Sophisticated scoring, allotted weights for numerous questions, person solution settings provided.
- Easy enhancement of output pages in WYSIWYG editors which includes Dream Weaver software.
- A timer on checks and exercises and Media documents related to the direction may be robotically uploaded to the www.hotpotatoes.internet server, in order that newbies can get entry to their results.

5. Google Forms + Flubaroo

These both of the tools are largely used tools available on the internet. Google Forms are very widely used and well employed for creating and sharing tests at no cost. All of you can easily create a form, fill in answer keys and assign the quiz. Then you may use the Flubaroo tool to do the grading.

Implementation and Constructing:

- **Step 1:** To make assignment, firstly go into your Google Drive, create a new "form" with the aid of clicking "NEW" and finding "Google Forms". Add the questions to assignment, store and cease the form.
- **Step 2:** Enter the solution keys and fill in the best solutions and call for in addition identity.
- **Step 3:** Share with students and employees and Post a hyperlink to your internet site or ship it through email, Google Classroom or whichever channel works for you. Users will enter their entries and their responses will seem within the spreadsheet.
- **Step 4:** For grading the results, the admin will Open the spreadsheet related to the forms, and set up Flubaroo as a plugin to Google Forms proper from the "Add-ons" menu. Once set up, Flubaroo will provide you with some questions, inclusive of whether or not precise questions must now no longer be graded, that are the identity questions, which access serves as the solution key, etc. When you're answering, the quizzing software program will begin grading!
- **Step 5:** Last step is grade review. The Flubaroo-generated grades can be saved within the "Grades" worksheet. For every submission, Flubaroo will decide which questions were given an accurate response (one point), which had been spoken back incorrectly (0 points), and which remained ungraded.

3.5 Managing Data, Analysis of results and tracking student achievement using ICT Software Tools:

E-Learning knowledge has proven to increase through the years even earlier than the pandemic. Encouraged through the fashion and prompted through the pandemic, instructors have began out to harness a brand new version of teaching. A well-thought-out method in e-gaining knowledge lets in college students and instructors to crew up whether or not it's for getting access to important e-gaining knowledge of material, on-line homework assignments, or permitting college students to enjoy a self-paced gaining knowledge of practice.

Google Calendar: Google Calendar is a net preparation time and venture the executives will recognize to line software that grants admittance to schedules via web packages. Schedules might be made by way of schools and imparted to human beings, educators, and understudies. Tokens of ordinary physical activities are probably emailed, instant message, or spring up messages inside an internet software. Clients region unit authorized to make as many schedules as they determine on. One can have day, week, month, and year examine the schedule. Google schedules might be used by people like understudies, instructors, and directors in programming their very own time. But these universities will make use of Google Calendar to oversee time, coordinate visits, and provide events with others. Academic exercising divisions, understudy golf equipment, and have a look at corporations will create and percentage Google Calendars.

Educators will provide present day information on amassing times, cutoff times and work surroundings hours with understudies, nevertheless as put up documents or show statistics to their schedules. These

choices will facilitate the administration of researchers by giving best statistics and updates. Spread of readings or put together is probably accomplished by way of the associated documents. For college students, Google Calendar offers some approach for finding out thus far elegance information and enables in running together with others.

Some more uses of it are given below

1. It presents statistics on when instructions begin, when college opens and closes.
2. It indicates sports to be accomplished with the aid of academics and college students.
3. It assists in regulating the sports of college students and the team of workers of a specific college.
4. It helps and complements pupil hobby and interest and stops intellectual and bodily strain.

3.5.1. Technologies Tools and for Connecting with Parents:

Email: Schools can make and transport a class paper to hold guardians in the know regarding electronic mail. They can gather electronic mail addresses toward the start of the personnel year or supply mother and father the chance to join the bulletin at the workforce's web website. Every instructor can send messages when there are issues inside the review room or to offer father and mother reasonable news around their kids' concentrating on framework. Emails can be sent as far as I am concerned or in organizations. It is exceptionally simple to foundation enterprises in the most typical email applications. Guardians can analyze and react to messages each time they have the opportunity. Messages additionally are to be had at the LMS and student commitments concerning meetings and conversation board presents are mechanically messaged on the gadget.

Site or Blog: On the school webpage all staff realities like contact information, anticipations, personnel rules, school and educators, the method for utilizing the Internet at home, etc. The site can have a schedule with helpful records about workforce excursions, father and mother' nights, and a guide with pictures of researcher sports, etc. The staff can make its own special site on a leased net site on the web or can utilize net facilitating destinations without cost. Many schools utilize free writing for blog administrations from Google and wordpress to give data to mother and father, understudies and the overall population.

Online Survey: Technology as of now allows for brief response from mother and father through online studies. Instruments same as the Google shape and the test monkey might be effortlessly set up to get realities from guardians and local area members. These as of now are not handiest obtained realities they anyway additionally perform fundamental assessment and results are provided mechanically for quick independent direction.

Virtual Learning Environments: A virtual getting to know environmental factors (VLE) is a product application intended to help instructing and examining in a training environmental elements. VLE will usually chip away at line and give a gathering of devices like check (especially mechanically stamped sorts, comprehensive of more than one decisions) or self-evaluation, discourse board discussions, content transferring, understudy recovery, peer audit, researcher association the executives, social affair and altering student marks, survey, following hardware, and numerous others. New capacities

in those applications envelop wiki, online journals, RSS and three dimensional noticeable acquiring information on regions. Clearly VLE or Learner Management Systems (LMS) has its own coordinated discussion modules to chat with understudies who're subsequently regulated with the guidance of guardians at home. MOODLE is quite possibly the most popular open stock Lm. The outlined MOODLE capacities on its web are on webpage www.Moodle.Org

Media Sharing: It is by and by reasonable to rate different assortments of media online. Most well known video sharing sites use online video sharing locales like YouTube. Schools can utilize this to speak with mother and father via sharing school related recordings, nurturing recordings on nurturing strategies, assisting undergrads with controlling strain, time, etc. The school-related sound programming can be communicated through webcasts utilizing on-line podcasting destinations. Introductions for teachers and others might be imparted to mother and father through slide sharing sites. Photographs can be shared utilizing flickr.

Interpersonal organizations: It is suitable to utilize web-based media frameworks which incorporate Facebook, Twitter or MSN to talk with father and mother. It is feasible to frame organizations on Facebook and rate information with guardians. Guardians can get in touch with one in everything about kids' talk rooms. They can share previews, critical realities, and so forth. Facebook isn't that difficult all the time to write compositions with and many mothers and fathers have as of now got a Facebook account. An absolutely exhilarating web website for training guardians to apply Facebook is http://facebookforparents.Org/

Online Groups and Forums: Communicating with guardians is made simpler by the utilization of gatherings and electronic mail bunches which incorporate Google Groups and Yahoo Groups. A workforce can shape a gathering of father and mother using Google or Yahoo contributions to speak with and among mother and father. It is likewise doable to extend reports between establishment members.

SMS and Instant Messaging: School can deliver SMS to father and mother while a baby is out of school. Guardians will accordingly comprehend when their little child is playing truant. If a personnel needs to transport a pressing message to father and mother, the workforce can send a joint SMS, alert guardians or individual SMS to contact a chosen figure. Presently a quick moving assistance like whatsapp could be exceptionally well known with instructors, understudies, and mother and father. The straightforwardness of this gadget makes it smooth to send insights to mother and father. A particular Whatsapp establishment can be established to keep a conversation on a chosen theme.

Google chrome expansions and applications: Many educators who use Chrome and Chrome Devices for Education need to pressure the establishment or suggestion of Chrome Web programs on their understudies' gadgets. In any case, while you look at the many Chrome net applications accessible, it isn't persistently clear which of them are agreeable depending on your tastefulness. Google has made the Chrome App Packs, that are organizations of famous applications from the Chrome Web Store intended to fulfill the desires of users.

3.5.2. School Management Tools

Teaming up to rate thoughts and talk with educators, mother and father, high school understudies and organization individuals will turn into an essential piece of school control. The executives comprise affirmation of understudies to various subjects, doling out educators to subjects and examples, keeping realities, talking with guardians, preparing different endorsement, dissecting various records, etc. It should help all partners to effectively partake in decision making. The obligations of a workforce executive are to deal with the personnel and to figure out rules that are reliable with the desires of the school and the interests of the researchers as a whole. The major is answerable for getting sorted out the staff determined to make a dominating environmental factors for his understudies and developing skills. Subsequently, likewise to the time and strength spent in the workforce the board, the school director must have a phenomenal ability of the actual school and how formative tutoring might be, not utilizing school the executives programming might be a misuse of your work and time. Beforehand school control transformed into completed without programming programs. Be that as it may, today we live in a virtual world and wishes are changing over. Luckily, there are a lot of school control programs accessible without spending a dime. Some of them are listed underneath for exceptional reference in Open Admin for universities.

- **FeKara:** FeKara, a total school control programming that might be thought about as totally free programming. It incorporates contemporary school control and control programming alternatives. It can be utilized for evaluations, tasks, financial plans and interior messages. The main effect of FeKara is that it's far more intended for little schools that are less difficult. Extra records stockpiling and different elements are accessible with regards to installment premise. Site http://fekara.Com/

- **SchoolTime:** SchoolTime is likewise a comparative type of school for executive programming .It might be moved up to a free programming program for extra advantages. Web webpage: https:// personnel time.Co/#

- **TS School:** TS Short School Time Software School is a viable collectible instrument that gives staff underpinnings, everything being equal. TS School is ready to control your group of laborers. The TS School offers a student the executives framework and an appraisal module. What's more similar to SchoolTime and FeKara TS School is that has a paid model that offers extra functions.Website: http://www.Ts-college.Com/

- **Fedena:** Fedena or task Fedena is an open school control programming program that spotlights on record control. In light of Ruby on Rails. It began with a gathering of designers at Foradian Technologies. The mission was made an open inventory via Forodians, and is presently being kept up with by utilizing an open source network.Website http://www.Projectfedena.Org/

- **Rise SMS:** Ascend SMS is a free total school board programming program intended for Catholic and private universities. Rise SMS offers a whole bundle bargain. From bestowing a school nurture wellness board machine to a parental cell cellphone application to a simple field detailing machine. In spite of the fact that Ascend SMS is free for greatest resources, to find that staff should be recorded in their product. Site http://www.Ascendsms.Com/

- **School Tool:** A School Tool is a cloud based school control programming intended for schools in emerging countries. It gives instructor grade books, gifts appraisal reports, eminence participation papers, consistently supports diaries and hierarchical elements that incorporate projects comprehensive of Google Calendar, and an enormous document card generator. The School Tool depends on Python, and it chips away at Linux Ubuntu. The School Tool accompanies its own web server and webpage. To ensure that every one of the ideal parts are attached effectively, it's far apportioned through Ubuntu Linux. In any case, there might be an overabundance of School Tool. It is a definitely more adaptable mentor instrument than directors.Website: http://schooltool.Org/ (Can be downloaded from Ubuntu programming program center).
- **Open School Administrator:** Open School Administrator is as yet open source. It is a free, open-source programming program pack and approved under the GNU General Public License. Open Admin Schools gives programming program abilities consisting of essence, reports, the executives contraption; Open Admin Schools is one of the detached schools the board programming program choices with open sources accessible. Site owners give free staff support in agricultural countries. Site: http://richtech.Ca/openadmin/index.Html.

Open Admin for Schools is an absolutely web based gadget. Presently, many schools utilize this methodology. Intended to be advantageous for every server supplier necessities and organization transmission capacity. It at present has the resulting highlights:

- **Demographics -** Maintains scholar and own circle of relatives records that may be considered and published in plenty of ways.
- **Attendance -** Attendance may be attended with the aid of using college workplace secretaries or instructors within the classroom.
- **Report Card Program -** A bendy reporting device with goals for every lesson (as much as 20), including reporting of attendees, etc. All file playing cards are published as PDF reviews and might consist of the college logo.
- An on-line grade ebook to permit instructors to put up marks and exams on-line at college or at home.
- Parent / scholar viewing files to permit parents to view attendance and reporting playing cards.
- Payment device (and Lunch device) to permit scholar fees, print invoices, payments, invoices and export summaries to overseas accounting systems.
- Export / Import Modules - to permit inexperienced persons to effortlessly switch faculties inside classes without re-getting into demographic records. Data switch for different programs the usage of the XML-primarily based totally switch method.
- An on-line Daybook that lets instructors plot and consider their lessons / days. Currently, the most effective is the maximum uncommon activity.

3.6 Roles of information management, Process and Tools in Educational Administration and Management

Management Information System or MIS is a central data repository that can not only collect, organize, and store student data but also process and analyze and generate various reports on it. This is MIS in a broad sense.

The Education Management Information System (EMIS) is a system that monitors the performance of educational programs offered by the institution and regulates the distribution and distribution of educational resources. Manages, organizes, and implements implementation strategies to run the education system smoothly. Well, in the field of education, the MIS of education has a role to play in helping the educational institution grow. Initially, the main purpose and use of information management systems (MIS) was to make school office work more efficient. MIS provides administrators and teachers with the information they need to effectively plan, policy development, and evaluation. Today many institutions of higher learning are looking forward to using comprehensive education management solutions to guide educational processes and bring about better student knowledge.

3.6.1 The Role of the Education Information Management Program:

Student behavior can be closely monitored via EMIS. EMIS stores important student data such as personal data, test records, and even hostel and library information. Additionally, it tracks daily student progress.

In a developing institution, the progress of its teachers is just as important as the institution itself. Teachers can find detailed student-student analysis, their weak areas that promote personal learning and data-driven information to improve student learning outcomes. Management can also compare student performance each year, and change the delivery style and map out the results. Ease of tracking and analyzing the distribution of resources and costs is one of the main reasons for any senior management of an educational institution to look forward to implementing a student information system by integrating MIS. With resources, we mean everything that managers invest in: from property and infrastructure to learning resources and teachers.

Additionally, managers can fully control which teacher, faculty, and staff can access any type of data. For example, by avoiding financial management staff, administrators can lock student financial records for all other users, or else, academic performance data may be hidden from employees. Transparency and efficiency can be tracked to obtain clear information, helping to manage performance indicators.

3.6.2 Importance of Information Management System in Education:

- **Admission and management of inquiries**

  It is one of the most important stages in the education system to increase the potential of students and to retain existing ones. Educational institutions should choose a method that can help them to rely on the acceptance and management of questions in an orderly manner.

  Education management software helps institutions in the best possible way. It creates a smooth way to resolve all questions related to acceptance focused on transforming it into real-time students for a long time. In line with this, it helps to manage the educational objectives involving the current students of the institution.

- **Student management**

  The student life cycle is the only thing in any institution that needs to be better and better at any angle, whether it is admission, attendance, or testing. In order to be an effective institution, the institution must focus on student-centered management that can lead to their participation, interest, and growth.

- **Library management**

  The library is one of the most important parts of the institution. Students can find any important books whenever they need them, but they ask the librarian "how does it go to manage library records in person?" They found it very busy keeping a record of each book and asking the reader to return those books on time.

- **Student and teacher interaction and interaction**

  Co-operation and communication between students and teachers is very important in any educational institution, it needs to be very clear everywhere. Students, parents, and faculty need to work together and to communicate effectively in order to manage issues more effectively.

  The education management information system provides appropriate and easy management of student and non-academic activities for students. It provides a forum for parents to interact with teachers at any time and to provide feedback.

- **Financial management**

  Fundraising is one of the most important and fundamental sources of funding for educational institutions, but managing interventions in many institutions remains a busy, complex, time-consuming process.

  The education management system provides institutions with a fully automated financial management system, automates fundraising and receipt processes and sends alerts to parents and students about payment deadlines.

- **Test management**

  Testing is undoubtedly the most important and busiest time in educational institutions, during exams, skills that need to be organized and appropriate in each way. Test procedures require a seamless operation involving many categories from test managers, staff, teachers, test center managers, and many other people involved in order to make the test process more efficient and effective to make the whole process longer, time-consuming, busy, and difficult for all.

  The education management system software provides a complete overview of all processes by scheduling online exams and publishing results making it faster and more profitable for academics, students, and administrative staff.

3.7 UDISE: State and National Level Data bases in Education

U-DISE (Integrated Regional Information System for Education) is an internet site for Indian schools. The internet site is installed within the Department of School Education, MHRD, Govt. of India and is maintained with the aid of the National Information Center, Government. of India. The

Unified District Information System for Education (UDISE) released in 2012-thirteen consists of DISE Primary and Secondary Education is one in all the biggest School Education Management Information Systems masking greater than 1.5 million schools, greater than 9.6 million instructors and greater than 1,000,000 youngsters 264.

U-DISE is a fundamental supply of statistics for instructional making plans and assessment of development within side the Indian training region, particularly beneath Government-subsidized applications Sarva Shiksha Abhiyan (SSA) and Rashtriya Madhyamik Shiksha Abhiyan (RMSA).

U-DISE Data Recognition Requirement:

Needless to say, U-DISE as EMIS has been advancing the want for records and statistics within the faculty training region now no longer most effective to investigate policy, application making plans and control however additionally to satisfy the expertise wishes of researchers and training improvement team of workers in all countries. Although as a whole EMIS within the discipline of faculty training, U-DISE has been a success in constructing a wealthy internet site, its capability has now no longer but been absolutely exploited. In this context, it's been advised that an internet Data Program be advanced to sell U-DISE records in any respect degrees from countrywide to high school degrees with the aid of showing KPIs and associated signs in key factors of faculty training within the country. The Program of Action is anticipated to sell quicker to get admission to all stakeholders' statistics on faculty training in an effort to enhance evidence-primarily based totally decision-making and overall performance monitoring. In addition, the Visualization Program may even sell responsibility in any respect to degrees of 'exercise culture' within the faculty training region.

Data Visibility Scope

U-DISE collects records on greater than 4,000 variables, primarily based totally on a complete of ninety seven Key Performance Indicators (KPIs) decided on at the beginning stage and seventy eight at 2nd stage for inclusion in DVA. Trending KPIs divided with the aid of using gender, location, social class, control, wherein appropriate, at exceptional degrees of control inclusive of state, location and block are supplied to the DVA. KPI traits display modifications through the years both undoubtedly or negatively. It may be very vital to test the route and length of the KPIs through the years to test device performance. The KPIs are carefully associated with outreach that consists of college infrastructure and instructor deployment, participation, scholar mobility that consists of final touch rates, and gender, social and spatial disparities in college education.

Separating the facts is vital to expose styles, regularly hidden through in large part compiled facts. In different words, keeping apart facts certainly approaches dividing data into smaller agencies for a higher information of traits and styles. In addition, reading labeled facts is vital to tell selections concerning implementation, monitoring, efficiency, effectiveness and fairness of improvement interventions. Separated facts also can be used to symbolize precise coverage modifications, to offer proof of centered and differentiated planning, and to study styles through the years and to decide whether or not similarities or variations among small agencies emerge. DVA allows the advent of a separate evaluation of the significant data accrued from U-DISE for knowledgeable decision-making, application control and representation.

know Your Progress :

1. What is the importance of information and communication technologies?

2. Write any three advantages of the quiz.
3. What are the current trends in the development of E- LEARNING projects and educational technology?
4. How can training of distance education based on ICT enhance the quality of distance education?
5. What are the advantages and disadvantages of ICT based assessment?
6. Which is the best tool to measure teaching-learning intervention and the attitude of the students (school) towards the subject?
7. List two diagnostic tools used for the purpose of assessment.
8. How will one remove the barriers to online learning/learning?
9. List the records that help in understanding the growth and development of the students.
10. List any two database softwares.
11. Moodle is one

    - Online Survey Tool
    - Open Source Learner Management System
    - Budgeting Software
    - Safety equipment

12. Which of the following is not a social media tool?

    - WhatsApp
    - Facebook
    - FETA
    - Instagram

13. What is U-DISE and what is the purpose of U-DISE?

Point to Remember

ICT has made positive development in management. With ICT enabled management, these are:

- Citizens focus on service delivery
- Reorganization of Government Departments
- Best practices and redesigned work processes
- Better decision making, implementation, monitoring and evaluation
- Increase in efficiency and productivity
- Cost effective, consistent and seamless services
- Development of a participatory and cooperative policy
- Wide openness and accessibility
- Accountable, responsible and decentralized governance.

UNIT-4

Virtual Communities and Online Teaching Learning Resources

UNIT-4

UNIT 4: Virtual Communities and Online Teaching Learning Resources

Learning Outcomes

Technology has swiftly permeated across all levels and realms of education, especially with COVID-19 necessitating technology-mediated learning. The present unit discusses how teaching and learning have moved beyond four walls of a classroom to virtual communities, cloud computing and learning management systems (LMS) with open educational resources (OERs) and massive online open courses (MOOCs) opening self-paced pathways to learning with the click of a mouse. Within the online learning space or virtual communities, it is necessary to remember that technology is merely a tool to facilitate learning. At the same time, connectivism or collaboration is the essential element that provides coherence to the entire process of learning. The virtual communities, which are essentially learner-centred, seek to engage the learners meaningfully in areas of interest or purpose and overcome the time and place barriers. With technologies advancing in the blink of an eye, it is pertinent for teachers and educators to keep themselves abreast with the newer technological affordances and various initiatives taken by the Govt. of India to provide a seamless teaching and learning experience. Therefore, the unit explains different online teaching and learning modalities and ethical considerations that guide present-day technology-mediated learning spaces.

4.1 Introduction

- After completion of this module, the learners will be able to:
- recognise the importance of virtual communities and their implications for education;
- describe various modalities of participating in virtual communities for sharing and exchanging content and ideas (social networking, blogs, and discussion forums);
- explain the scope and challenges of virtual communities;
- explain ethics for online teaching and learning;
- illustrate pedagogic integration of various initiatives taken by Govt. of India related to open-source software and sharing of digital content;
- utilise LMS, OERs, and MOOCs for online teaching-learning; and
- Utilise online portals like SWAYAM-MOOCS for advancing their knowledge through refresher courses.

4.2 Online Teaching and Learning – an Overview

The exercise of teaching/studying with the help of an electronic tool or a gadget is termed e-learning or electronic learning. Commonwealth of Learning (2020) defines e-Learning as an umbrella term that refers to the use of any digital device or media (multimedia) for teaching and learning, especially for delivery or accessing of content. Thus e-Learning can take place without any reference to a network or connectivity. The digital device used by the learner to access materials need not be connected to a digital network, either a local area network or to the internet (or even to a cell phone network if a Tablet is used as a terminal or access device). (p. 3)

On the other hand, online learning "is e-Learning with a mandatory involvement of a digital network which a learner needs to access at least part of the learning materials and services. Online learning refers to network-enabled teaching and learning that allows the learner to have increased interaction with content, teachers and other learners" (Commonwealth of Learning, 2020, p. 4). Thus, e-Learning is wider in scope and encompasses online learning, which essentially requires the use of the internet or other network to connect and access services and resources available digitally.

Two of the major elements needed for online learning are computers and internet connection. With the advent of technology that ushered in a digital age, online education for teaching/learning has sped up immensely. In the current scenario across the globe, people are quite acquainted with the use of technological tools such as Smartphone, laptops, tablets. With the invention of these electronic gadgets, people started to connect on a much wider scale, especially with various social media platforms, which allowed them to exchange knowledge, information, and ideas with one another across the globe. Online education also enables an individual/group or an organisation to save, share information, e-notes/ materials in various formats like ppts, word documents, pdfs, images, film strips etc. The learners also can attend live seminars, webinars, and chat live with teachers and professors via video or chat forums in the online teaching-learning process.

Several internet-based/ online platforms such as virtual communities, blogs, social networking sites, and discussion forums have emerged to facilitate independent, cost-effective, and collaborative learning. The following section discusses the basics of a community that undergird virtual communities.

4.3 Basics of a Community

A community refers to a group/body of people/persons engaged in a social network of relationships (Preece, 2000). The community members may connect within a physical or virtual space. The group is often guided by common interests, beliefs or shared purpose/goals of building knowledge concerning academics, professional practice, or other areas of interest. Whether academic or professional, any community has its own culture and set of values that reflect its history and shared experiences (Garber, 2004) and forges a sense of identity and belongingness among the members (Schwier, 2002). However, a community may evolve over a period of time as the members interact and gain experience after synthesising information and may thereby "generate new meanings" (Garber, 2004).

Whether virtual or face-to-face, a community is nurtured through a host of social factors that outline that the mere presence of technology is an insufficient precondition for the success of any community. Collaboration is an essential ingredient that connects the community members to construct knowledge around the shared beliefs, goals, or purpose. The members may choose to interact as per their predilection and the priority attached to the group's purpose. Further, the communities may be classified into geographic-based and relationship-based communities; the latter focuses on human relationships (Gusfield, 1975). Most virtual communities are relationship-based (Jang, Olfman, Ko, Koh, & Kim 2008).

4.4 Virtual Communities – An Introduction

Digital learning communities encompass virtual communities to allow people to connect and collaborate. According to Preece (2000), "an online community consists of people who interact socially

as they strive to satisfy their own needs or perform special roles; a shared purpose that provides a reason for the community; policies that guide people's interactions; and computer systems to support and mediate social interaction and facilitate a sense of togetherness". "The success of any virtual community is determined by the extent to which it fulfils the needs or requirements of its members, which, in turn, develops a sense of community amongst the members, and they perceive themselves as an essential part of the community" (Brown, 2001).

A warm and personalised learning environment ensures that students build connections within the community that keeps them engaged in gaining and constructing knowledge. In turn, this necessitates a shift in teachers' perspective based on the emergent need to lead the process of changing learners' mindset from mere information receivers to information seekers (Prestera and Moller, 2001).

In virtual communities, the technology enables members to interact synchronously or asynchronously and influence each other through varied identities or infamous 'avatars'. Although technology is essential for building and sustaining a virtual community, there exist three communication hallmarks – interaction, engagement, and alignment among the community members that serve as an undercurrent to the success of virtual communities (Schwier, 2002).

Fig.1 presents the logos of various virtual communities powered by Web 2.0.

Fig.1: Web 2.0 Digitage 2012 by ocean.flynn is licensed under CC0 1.0

The building blocks that sustain and nurture any virtual community include a commitment to the learning process, reciprocity, trust (based on credibility and benevolence), persistence, continual flow of information, adequate support, virtual identity, acceptance, cooperation, and general satisfaction, among the community members (Brown, 2001; Rovai, 2002). The commitment to the learning process drives a continual flow of information within a virtual community. It enables the members to trust each other, learn from each other, and share thoughts and feelings. This, in turn, offers plurality in ideas

and relationships, autonomy (with the underlying belief of acceptance and reciprocity), and future orientation (how learning applies in authentic situations) in the process of knowledge construction within a community (Schwier, 2002). Also, specific policies and behavioural expectations regulate the conduct of members and guide their interactions within the community.

An overview of virtual communities is available at: https://youtu.be/PvZB2iz0JGo.

Educational Implications of Virtual Communities

1. **Self-directed:** Many virtual communities are often self-directed, unlike a traditional classroom; there is no instructor to lead the learning process. The absence of an instructor, at times, results in students constructing knowledge or accepting opinions of others at face value without any evidence to substantiate the claims. At the same time, virtual communities stand a chance for the learners to explore and learn new things at their own will and construct knowledge from their perspective as compared to tutored learning that occurs in the case of instructor-led communities.

2. **Self-paced:** Virtual communities allow the members to learn at their own pace and convenience. The learner can choose to select and control what s/he learns, when s/he learns, and to what extent s/he wants to gain knowledge on the subject commensurate with the purpose. The member or learner has the freedom to decide the duration and place of learning.

3. **Interactive learning:** A virtual community allows the members to interact freely and share their thoughts, beliefs related to the area of interest across time and space. The learners need not be positioned within the physical boundaries of a classroom as they interact with each other across various educational activities.

4. **Immersive experience:** The advanced virtual communities offer members an immersive learning environment that facilitates authentic learning. For instance, the learners need not necessarily perform the scientific experiments in person but may be provided with an opportunity to learn from various simulation videos or virtually conduct the experiments themselves through dedicated software that allows them to toggle with experiment essentials.

5. **Unorganised learning:** Compared to a traditional classroom, the learning process within a virtual community is less organised. Each member is free to share or post content as per their level of understanding, which may not cater to other learners' needs. Also, the content posted or shared by the members may not necessarily proceed gradually or progressively from easy to complex, thus creating gaps in learners' understanding.

6. **Multiliteracies:** The approach to multiliteracies emanates from the linguistic diversity and communication modalities that learners or members of a community bring with themselves. The advent of present-day technologies and proliferation in communication modalities coupled with transnational migration exerted tremendous pressure on the social environment, thus resulting in various dialects of any language. For instance, UK English differs substantially from US English. In virtual communities, learning is more diverse as people from different backgrounds join the communities and bring with themselves diverse cultures and languages. The cultural diversity within virtual communities provides a platform for the members to develop cultural sensitivity,

tolerance, and acceptance towards others' viewpoints. On the other hand, linguistic diversity expands the focus of literacy and enables the learners to make or generate meaning given different socio-cultural contexts. In this sense, virtual communities would afford opportunities to students to access evolving language of work and community and critically understand and engage in multiple discourses.

7. **Practical knowledge:** The knowledge gained through virtual communities is more practical than theoretical as people come together to share authentic life experiences. In this sense, the members of virtual communities socially construct the knowledge and generate meaning around the core areas of interest. In contrast to traditional classrooms, the learners within virtual communities may not necessarily start from the theoretical underpinnings of a particular concept but rather learn from the experiences of others.

8. **Lack of real-life relationships:** One of the main aspects of virtual communities is the possibility of their members never meeting in real life outside the online communities, resulting in the absence of any real-world interactions among the members. At times, the members may feel disconnected due to virtual avatars lacking personal identification and failing to provide any cues and develop rapport vis-à-vis face-to-face interactions. Facial expressions and gestures convey attitude, reactions, and cues that prompt learners within traditional classrooms and shape their responses, but it is often missing within virtual communities.

9. **Timely feedback:** Virtual communities provide an opportunity to capture and analyse interaction data and user content from online community interactions, thus making it possible to easily diagnose learning gaps, provide timely feedback, and take corrective steps to improve learning. For instance, a teacher may read students' comments on a discussion thread to ascertain students' level of understanding and adapt instruction to enhance the learning levels of students.

10. **Transcending geographical frontiers:** Education has transcended geographical boundaries through virtual learning communities, which are open to all people irrespective of their geographical locations. People of different age groups located in other parts of the world can connect and share knowledge, thoughts, and ideas synchronously or asynchronously at the click of a mouse, thus making learning truly a global experience resulting in the creation of international knowledge repositories.

Virtual communities can take various forms depending on their affordances. The most commonly used internet-based virtual communities are blogs, social networking sites, discussion forums, global classrooms, online universities, online chat rooms, internet message boards, Wikis, etc.

4.5 Sharing Thoughts and Ideas on Blogs, Social Networking Sites, and Discussion Forums

Amongst others, blogs, social networking sites, and discussion forums are avenues for sharing thoughts and opinions related to various topics that need not necessarily be purely academic. The members or the learners within these virtual communities may interact synchronously or asynchronously. The former relates to real-time interaction; people interact and exchange messages, thoughts, or

opinions at the same point in time. In contrast, the latter involves intermittent communication; that is, the members or learners need not be online at the same point in time and may post comments or responses on discussion threads as per their convenience and predilection. Synchronous modalities include Skype, Zoom, Cisco WebEx, Google Meet, whiteboard/blackboard embedded within various learning management systems (LMS). On the other hand, asynchronous modes include discussion forums, wikis, blogs, email, Facebook, Edmodo, YouTube, Teacher Tube, Khan Academy, Massive Open Online Courses (MOOCs), Twitter, Google Classroom, etc.

4.5.1 BLOGS

Blogs are essentially weblogs and serve as an asynchronous tool for teaching and learning online. Akin to an online journal, blogs entail the blog authors or bloggers to express their opinions, share feelings and content related to any area. In this sense, blogging can be identified as a communication channel that enables one-to-many communication 'type' (Armstrong & Hagel, 2009). But in recent times, the concept of multi-author blogs has also emerged wherein multiple authors contribute to creating a blog; in that case, it would be many-to-many communication 'type'. Often, the blogs are written from a blogger's perspective, which may not necessarily be objective, true, fair, factual, and transparent; thus, information available on a blog may be biased and unscientific. Hence, one needs to exercise caution when retrieving and relying on information or any content available on a blog. Still, blogs serve as an important tool for both teachers and students.

Blogs facilitate regular content sharing, reflective writing, and the expression of creativity. A blog may include general information about anything, learning content, audio and visual content, opinion, syntheses of several articles or pieces of information. Usually, the last post appears on the top of the page; the chronological order moves from the most recent to older posts. Blogs are available for viewing to the public and often open for discussion and collaboration, although some blogs are private.

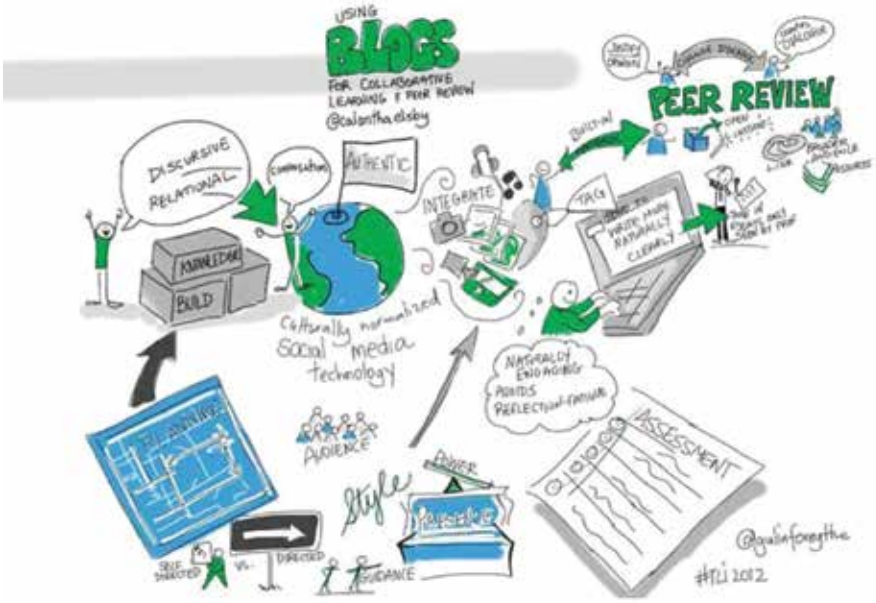


Fig.2: BLOGS for Collaborative Learning & Peer Review by giulia.forsythe is licensed under CC BY-NC-SA 2.0

There are many types of blogs depending on the style (interactive or closed), content (personal, political, social, economic, information technology, etc.), and author (instructor, student-led). In education, primarily instructor and student-led weblogs are common. The instructor-led weblogs are usually created and managed by the instructors or teachers for course management purposes, whereas student-led weblogs mainly focus on projects and other collaborative works (Luján-Mora and Juana-Espinosa, 2007).

An overview of what is a blog is available at: https://youtu.be/NjwUHXoi8lM.

USES OF BLOGS FOR TEACHING AND LEARNING

A blog may serve several uses such as:

1. **Sharing content and engaging students:** Teachers can use blogs to share core learning content with additional readings, publish assignments, and keep students and their parents informed about upcoming school events, due dates for submission of work, syllabus covered, etc. Educational blogs can engage students in meaningful discussions and extension activities.

2. **Reflective writing and creativity:** Blogs can serve as an important tool for reflective writing and creative expression. Teachers can encourage students to write blogs to improve their writing skills; thus, building students' confidence to share their thoughts, ideas, opinions, expectations, and fears within the public domain.

3. **Means to disseminate information:** Blogs can serve as a powerful tool for disseminating information and educating others. Like a website, a blog offers several advantages, such as adding audio-video content, images, files, etc. Blogs also encourage the visitors to read through the content to gain information, thus enhancing the reading skills of the visitors.

4. **Promotes interaction, cooperative and collaborative learning:** Blogs offer the visitors to participate and express their agreement or disagreement with the views held by the blogger. On the other hand, static websites seldom provide similar opportunities for their visitors. At their own free will, students can create blogs for various purposes such as dedicated clubs and committees for sports, exploring possibilities of newer affordances of technology related to teaching, etc. Blogs can also be used for brainstorming ideas and promoting cooperative learning. Collaborative learning occurs especially in project-related blogs wherein roles are clearly defined, and each member is expected to make a particular contribution. In contrast, there are no predefined roles for other types of blogs, and engagement across discussion threads is voluntary.

CREATING AND BUILDING A BLOG

Creating and building a blog for sharing and posting content is simple and easy. Many blogs hosting sites often include guided instruction in creating a blog and posts. While some websites may charge a premium for hosting the content or providing an advanced user interface for blogging, some popular websites host content for free (WordPress, Wix, Blogger, LinkedIn, Medium, etc.). Although the steps for creating a blog may differ across different websites, a general chronology that applies to most of the blog building sites is as follows:

1. **Choose a blogging website:** To host the content, a blogger needs first to choose a website that meets the intended purpose. Although host websites often do not charge anything for hosting the content, they may charge a premium for providing an advanced user interface that facilitates the blogger to use advanced plugins, tools, and customised codes for creating the blog.

2. **Register and customise a domain name:** After choosing a host website, a blogger needs to register through email and customise a domain name that best describes the blog. The domain name is the blog address or URL that anyone can use to visit the blog.

3. **Select a template:** After selecting a domain name, the blogger may choose an existing or customised layout for designing the blog. Some websites may charge a premium for allowing the blog authors to write advanced codes for customising the layout and running additional plugins, codecs, and extensions.

4. **Create and publish posts:** Once a blog is created, the blog author can include a section that may provide information to the visitors about the blogger; however, it is optional. The bloggers may share their views in the form of a blog post regarding anything and publish it to go live and be accessed by the visitors. Usually, the blog posts appear in chronological order, with the most recent posts appearing at the top of the blog. The blog posts often contain personal views of the blogger on specific topics and can be complemented with pictures, videos, and audio notes or podcasts.

5. **Engage with followers:** The blogger may interact with the followers through the comments section. This may lead to meaningful discussions and allow for diverse points of view to flow on the subject. However, it is optional for the blogger to enable comments for each blog post. Also, the blogger may interact with the followers or visitors through the feedback section to improve the blog.

A tutorial on creating a blog can be accessed at: https://youtu.be/NdVHrTRD3wU.

BENEFITS OF BLOGS FOR TEACHING-LEARNING

Blogs entail several benefits discussed below:

1. Anytime, anywhere learning: Blogs carry the potential to provide access to educational content to students at their convenience. They offer 24/7 access to the educational content, thus transcending the four walls of the classroom and promoting self-initiated and self-directed learning.

2. Critical thinking and acceptance of diverse views: Through blogs, teachers and students from diverse backgrounds can connect on topics of interest and share their ideas, thoughts, and opinions. This instils acceptance and respect among the students and teachers towards different viewpoints and promotes critical thinking as each blog visitor or user analyses the shared content from his/her perspective to weigh the pros n cons and arrive at a conclusion. Thus, discussions occur in more discursive and thoughtful ways.

3. Easy publication: Compared to the traditional designing of websites which is a complex and time-consuming process, creating and building blogs is much easier and quicker. The contents of the blog (text, pictures, videos, audio, files, etc.) can be updated and published from anywhere without the knowledge of programming languages and codes such as HTML, JavaScript, FTP, web authoring software, etc.

4. Large outreach: Weblogs can reach a large and diverse audience base while maintaining the quality of the material and allowing for various levels of depth.

5. Regular feedback: Regular and frequent feedback from the instructor or teacher coupled with suggestions from peers minimises the scope of errors and increases the accuracy of outcomes, especially in project-related weblogs. Teachers can monitor the direction and progress of students' work in real-time and provide corrective and constructive feedback to enable students to incorporate suggested improvements timely.

6. Self-expression and creativity: Blogs, akin to journal writing, enhance the author's writing prowess and facilitate informal communication with a large audience base. The blogger can express his/her thoughts and creative, new, and innovative ideas through a blog.

BARRIERS IN USING BLOGS FOR TEACHING-LEARNING

The various barriers that impede the process of teaching and learning through blogs are:

1. Instructor unavailability: Availability of instructor or teacher when teaching-learning through weblogs is erratic as primarily it is an asynchronous mode of communication, and hence, teacher and students may not be connected at the same point in time, which could result in missing cues from the instructor that may prompt learners, missing direction, and slow feedback.

2. Difficult to assess student learning: In the absence of clear expectations, it may be difficult for instructors or teachers to assess and grade student learning based on students' participation rate in the blog, group work undertaken by the users, quality of posts, frequency of posts, etc. There could be instances of disengaged learners as going through blog posts is time-consuming and involves extensive reading, which might not suit all learning needs. Also, conflicts may arise in scheduling the group work, especially in project-related weblogs, due to time conflicts. Thus, grading over blogs may not be a source of authentic assessment.

3. Lack of structural and networking support: The use of technology may invite several structural, technical, and networking barriers. Structural barriers such as lack of devices, computers, labs, cost of internet and unstable connectivity, etc., impede seamless use of technology for teaching and learning. Also, lack of participation impedes the development of relationships and group connections.

4. Digital divide: In India, a large audience base lacks technical and basic literacy, which is one of the major barriers to learning through weblogs. Technical barriers such as lack of computer proficiency, necessary resources, and software limit the use of blogs for the teaching-learning process.

5. Advertisements: Although many blogs are hosted on websites that do not charge the authors, advertisements often cover a considerable part of the page and override the content, distracting the learners and breaking the learning flow. Therefore, educational blogs should be preferably hosted on private servers that are ad-free to maintain learner concentration.

6. Lack of netiquettes: In the case of a public blog, anybody and everybody has the liberty to express their opinions in any manner, which may disrupt the ordinary course of educational discussion.

The content posted by such unscrupulous elements may be insensitive, provocative, abusive, insulting, inflammatory, trolling, unrelated to the topic, lack factual accuracy, biased, etc., which may disengage the learners.

7. Security concerns: In the case of a public blog, anybody and everybody have the liberty to express their opinions in any manner, which may disrupt the ordinary course of educational discussion. The content posted by such unscrupulous elements may be insensitive, provocative, abusive, insulting, inflammatory, trolling, and unrelated to the topic, lack factual accuracy, biased, etc., which may disengage the learners.

4.5.2 SOCIAL NETWORKING SITES (SNSs)

The infusion and subsequent integration of the Information and Communication Technologies (ICTs) have led to a paradigm shift in how teachers and learners engage with the content and learn collaboratively. Essentially, the phenomenon of social media can be traced to Web 2.0 and can be defined as "a group of Internet-based applications that build on the ideological and technological foundation of web 2.0 and allow creation and exchange of user-generated contents" (Kaplan & Haenlein, 2010). There is a consensus that mobile devices and social media significantly influence the way learners explore and learn while transcending the physical boundaries. According to Boyd and Ellison (2007), SNSs are "web-based services that allow individuals to:

1. construct a public or semi-public profile within a bounded system,
2. articulate a list of other users with whom they share a connection, and
3. view and traverse their list of connections and those made by others within the system." (p.211)

Fig.3: Social media, social networking, social computing by daniel_iversen is licensed under CC BY-NC-ND 2.0

The adoption of SNSs complement teaching and learning, enhance academic performance, and promote interactive and collaborative learning at per learners' pace. SNSs such as Facebook, Academia.edu, Instagram, Classroom 2.0, Edmodo, TechEd, Teacher Tube, Twitter, Vimeo, LinkedIn, ResearchGate, etc.

are often considered a part of disruptive technologies as they significantly alter the way teachers and students access content, interact, generate meanings, and learn. Such technologies primarily intend to offer learning opportunities to teachers and students who do not have access to traditional learning modes. However, they also provide a platform for learners to explore beyond the basics. Students can post their doubts, and their peers or instructors can answer them to give explanations and clarifications. Learning through SNSs enhances the learners' digital learning skills and develops their netiquettes.

An infographic guide on how a teacher can use SNSs for connecting, teaching, curating and notifying can be viewed at: https://blogs.onlineeducation.touro.edu/a-teachers-guide-to-social-media-infographic/.

BENEFITS OF USING SNSs FOR TEACHING-LEARNING

Adoption of SNSs for teaching and learning offers several benefits as follows:

1. **Anytime, anywhere access with self-paced learning:** SNSs entail 24/7 access to course contents and complementary learning resources such as audio-video, files, lecture notes, etc. The users have the opportunity to access learning resources, interact with peers, mentors, and teachers, and discuss academic and other institution-related issues. Also, the learners enjoy the privilege to pace their learning as per their style. There is no pressure on the learners to learn at a particular point and appear 'all understanding' even when they cannot comprehend the basics.

2. **Sharing and acquiring knowledge:** With the help of mobile devices and social media, students can co-create, edit, and share educational content and resources in various formats such as pictures, audio-visuals, etc. Advancements in technology, such as SNS, have led to a paradigm shift in ways learning occurs within the shared space and evolves a culture of exploration, interaction and collaboration that seeks to engage learners constructively. Owing to the personalised and customisable environment entailed by SNS, the learners enjoy comfort in learning which increases their interactivity and enhances motivation.

3. **Cost-effective:** The use of SNSs for obtaining teaching and learning material is cost-effective as the internet packs are priced more or less nominally, although a significant amount is invested in purchasing devices like computers, laptops, iPad, smartphones, etc.

4. **Improved collaboration and academic performance:** SNSs allow users to share content and thus build a culture of sharing that enables the users to contribute to the community openly and construct knowledge collaboratively and through instructor/teacher/expert guidance. Such communities allow learners to adjust and develop academic self-efficacy, enhancing their confidence, and prompting them to perform better.

5. **Increased interactivity:** SNSs allow students to interact synchronously (chatting, online discussion, video conferencing, live sessions, live Q n A rounds, etc.) as well asynchronously (comments, file sharing, lecture notes, games etc.) with their peers and instructors/teachers while accessing course contents. Also, SNSs provide opportunities to introverts or recluse students to express their thoughts and opinions and interact through social media, thus leading to collaborative learning and enhanced self-confidence.

6. **Increased engagement:** Students' engagement encompasses physical and mental involvement and time investment to gain knowledge. SNSs facilitate student engagement in varied ways through different activities. When students interact with peers and teachers on a particular topic and share ideas over SNSs, they are actively involved in constructing knowledge, which increases their interest levels and prompts them for self-directed learning resulting in better grades. Often, engaged learners tend to be more perceptive and driven by the intent to learn, which allows them to participate frequently in different classroom extra activities.

7. **Enhanced technology-related skills:** Present-day students are more techno-savvy than instructors/teachers. In a nutshell, the present-day learners are digital natives, whereas their instructors/teachers/mentors are digital immigrants. Therefore, modern learners are more adept at using various affordances offered by SNSs and can utilise them effectively for communication and various class-related tasks. Also, SNSs entail an opportunity for not so techno-savvy learners to develop 21st-century digital skills. Additionally, through SNSs, learners can improve their writing skills leading to enhanced vocabulary.

BARRIERS IN USING SNSs FOR TEACHING-LEARNING

Teaching and learning through SNSs can be a challenge in itself due to the barriers include:

1. **Fraudulent/pseudo/fake/impostor accounts:** One of the most common barriers to teaching and learning through SNSs is the presence of a large number of impostor accounts that indulge in unsolicited activities with the intent to gain access to various communities or groups, build trust therein, and then take advantage of the vulnerable students through extortion and other unethical, illegal acts. Such impostors or impersonating account holders use fake credentials and prompt innocent students to divulge personal details like phone numbers, bank account numbers, credit card information, etc. At times, the fraudster may use personal pictures of known entities to befriend and target students. Students can become a victim of sexual harassment, cyberbullying, etc., especially during interactions through SNSs. In teaching-learning communities created through SNSs, there is always a risk of unscrupulous elements targeting students and triggering political or religious discussions that may disorient the learners and cause animosity. At times, the unsocial elements may look safe and trustworthy seeing the number of followers they have, but caution needs to be exercised as it could be a mere gimmick of the system in the form of bot accounts.

2. **Account hacking:** Hacking is one of the common threats while using SNSs. Through hacking, the unscrupulous or unsocial elements gain access to the accounts of innocent students in a deceitful manner and may use their name and details to post inappropriate content, ask for financial favours, retrieve private information, etc.

3. **Social Malware:** Social malware or socwares unknowingly get installed in systems while downloading resources available on the internet. In the name of promising awards, gifts or lucrative gains, the malware infiltrates the user devices and gains access to confidential and private information such as passwords, credit card details, bank details, etc. For instance, malicious software's related to SNSs such as Faceliker, Scareware, Likejacking, etc., gain access to users Facebook account and trigger activities such as unknown likes on posts and pages, scaring people on the pretext of a system crashing due to virus and forcing them to install some antivirus,

control microphone and camera without the consent of the user, etc. Such socwares are no less than predators who seek to target innocent and vulnerable students.

4. **Phishing:** By tracing the antecedents of a user's browsing activity, their interests may be ascertained with the help of which the attackers can impersonate as 'Company A' and send unsolicited communication (e.g., click on the link to claim your gift, click here to verify your account or it would be deactivated) to the users or students for retrieving their personal information. Opening a fake Facebook page of an existing user is also a phishing attack.

5. **Lack of trust:** Generally speaking, there is a lack of trust among the members regarding the connections developed through SNSs. Since the interactions occur over the virtual space, there always remains a gap compared to face-to-face interactions.

6. **Difficulty in selecting the appropriate content:** Students and teachers often feel overwhelmed when choosing the content that matches the core curriculum due to the wide array of online and social networking resources.

7. **Cyberbullying:** Children and youngsters often face cyberbullying, which occurs when someone tries to harm others through ICTs. The predators or cyberbullies at first gain the target or student's attention by striking a conversation around the interests or hobbies or music, showing extreme love, empathy, kindness, and compassion, or sending desired gifts to their targets. After gaining the students' trust and making them feel comfortable (could include explicit chats), they prompt students to share their innate feelings, problems, and other issues. After that, the bullies may post hateful, humiliating, explicit, insulting, confidential content or divulge secrets with the victim's friends.

8. **Similar name fraud:** At times, attackers may use a domain name similar to a famous website to steal students' personal information. For e.g., Facenook, twiitter.com, and so on.

9. **Violation of privacy and confidentiality:** Often, users upload publicly viewable pictures on SNSs that may reveal confidential information about the user, their location, camera brand, model, resolution, and so on. Out of these, disclosure of the geographic location poses the most dangerous threat as a person can be easily tracked and taken undue advantage of. Also, the attackers may use students' photos in undesirable ways, such as superimposing images over pornographic content, which will cause humiliation to the student, and s/he may agree to give in to unreasonable demands of the attacker. Furthermore, the attacker may send embarrassing communication to the victim's friend list or share private messages with the public to tarnish the victim's image.

10. **Mobile Applications:** In general, students and users should avoid installing unverified applications that may steal important data, track one's whereabouts, save personal details, messages, and passwords, and lead to data loss in case of clickbait.

11. **Social Network Diseases:** Spending long hours over the SNSs carry its own set of repercussions such as health problems that may include attention-seeking behaviour, social network addiction to escape reality, fear of missing out (FOMO) in case one stays away from SNSs for a while, anxiety, photo lurking– browsing endlessly through others' pictures, depression after comparing oneself

with others, hidden illiteracy– that is people know how to read and write but are unable to use these skills, hikikomori or withdrawal disease wherein one considers the world to be limited to virtual reality and chooses to be on the computer throughout the day while neglecting their responsibilities.

12. **Language distortion:** Often communicating over the SNSs leads to language distortion; that is, students and users in general resort to the use of slang, short forms, or mixing of two languages like Hinglish (mix of Hindi and English) with the underlying intent of sharing everything in too little words and time. Also, the use of Emojis is another barrier that impedes clear communication as one always has the opportunity to interpret the expression conveyed through emoji differently from what is actually intended. Also, such deviations sometimes manifest during formal writing, such as tests, applications, petitions, homework, etc.

MEASURES TO SAFEGUARD TEACHERS AND STUDENTS WHILE USING SNSs FOR TEACHING-LEARNING

Some of the measures that students and teachers can take to safeguard their interests while using SNSs include:

1. Use a unique password that could include a combination of alphabets, numbers, and special symbols. Students should not save passwords on shared computers (e.g., cybercafes). Also, it is desirable to use a secure connection and change the password at regular intervals.
2. Multifactor or two-factor authentication is a wise choice to access social network accounts. For instance, two-factor authentication could include confirming the one-time password sent on the mobile device and the face lock feature.
3. It is always desirable to install an authentic operating system with antivirus software and regularly update it to keep it safe from phishing attacks and malicious software.
4. Also, students and teachers should periodically backup the data to avoid any data related attacks that seek to extort money on the pretext of restoring or returning data.
5. Students should not accept friend requests from strangers and follow proper regulation of time s/he spends on SNSs to avoid any addiction.
6. Encrypted connections and chats should always be preferred over unencrypted ones.
7. Because of spyware, students and teachers should exercise extreme caution to ensure their mic and webcam is off when not in use to avoid theft of personal information.
8. Students and teachers should update themselves from time to time with the changes in privacy settings, security and data-use policies and their impact thereto.
9. The students and teachers should immediately report instances of cyberbullying or harassment or any abuse to the competent authorities to punish the offenders.
10. While granting permissions to applications, it should be noted that what all is being shared with the apps.

11. Students and teachers should develop proper netiquettes such as acceptance and tolerance towards others' views, cultural sensitivity, etc.

12. Students and teachers should know what constitutes criminal activity and the legal recourse available to the victim.

13. Students and teachers should not divulge personal details, location, and other sensitive data over the SNSs to avoid the occurrence of any mishap.

4.5.3 DISCUSSION FORUMS

The rampant advancement in technology coupled with the growing demand for digital education has resulted in Technology-enabled learning rapidly permeating the higher learning institutes globally. With time more and more schools and higher learning institutes are rapidly adopting this digital age education and making way for online teaching/learning. Much research has been conducted which points to the fact that the use of Information and Communication Technology (ICT) for teaching/learning is growing faster than any other aspects of curricula change. Also, the rapid technological innovations occurring across the globe have overhauled the existing instructional processes which has led to integration of technology across the curricula (Hu et al. 2018).

To address the teaching and learning challenges that have cropped up in recent years, it has been argued that if the subject matter to be taught were given to students online before face-to-face class interactions; then during the live class, it would enable the students to concentrate fully on the lectures and note down only the key points of the discussions. This is where platforms such as Discussion forums come to play.

MEANING OF DISCUSSION FORUMS

Discussion forums can be defined as "popularly used tools that enable a student or staff to interact or communicate online in an asynchronous manner with the help of written posts, content, ideas etc." If we talk about online or distance learning, discussion forums are widely used as the main tools for interaction/communication between and among students, teachers, and other interested parties. In this sense, discussion forums, as a communication channel, allow many-to-many communication 'type' (Armstrong & Hagel, 2009). On the other hand, if we take up blended learning, then the role of discussion forums changes with them now acting as a supporting tool for face-to-face learning.

According to Nandi, Chang, and Balbo (2009), an online discussion forum is an "ubiquitous communication tool within an online learning environment" that significantly influences the kind of interactions taking place within virtual communities. As communication/interaction tools, online discussion forums support interaction, popularise ideas, and facilitate exchange of knowledge among the learners and educators, which results in favourable outcomes. In further research, the asynchronous nature of online discussion forums enables the members to successfully communicate with each other at any given point of time and place without any restrictions being placed on them in terms of time or space factor. One of the good things about the discussion forums is that everyone can easily access the information posted at their convenience and at their selected or preferred time (Nandi, Hamilton, Harland, & Warburton, 2011).

Marra, Moore, and Klimczak (2004) believed that the discussion forums are an important element in the online courses and claim that "instructors and students rely on these asynchronous forums to engage one another in ways that potentially promote critical thinking, meaningful problem solving, and knowledge construction" (p.23). Asynchronous online discussions and reflections on in different subject areas can be just as fruitful as the traditional, synchronous and in-class discussions. In an online environment, the students can individually, as well in a team, deliberate and contribute to the ongoing discussions in a meaningful manner and reflect on other students' contribution to the discussions, which may otherwise can be somewhat difficult in a traditional classroom setting (Tan, 2016).

KEY BENEFITS OF DISCUSSION FORUMS

1. **Individualised learning:** One of the key elements in discussion forums is that the learning is highly individualised, implying that the members are free to respond to various topics according to their freedom of time and space. They are not limited by any lengths meaning an individual is free to talk as much as one wants about the topic that interests them.

2. **Encouragement of critical thinking:** Good forum topics are open-ended, and they encourage participants to take a stand on any particular issue of their liking. Responding in a forum requires a thorough organisation of thoughts and critical evaluation of the concepts introduced in a class. When a participant's views are challenged, they typically review the added feedback and carefully reconsiders the new ideas challenging the critical thinking powers as they do so.

3. **Student autonomy:** Students have the option of reflecting on their thoughts while also reading the thoughts of others. Many students admitted to routinely discussing the forum topics with friends and family outside of class before posting their thoughts online.

4. **Creative expressions:** The traditional teaching-learning method severely limits the quality of discussions and experiences possible in a course. Regular forum discussions have an edge as they add hours of interaction and communications over a given semester or course duration.

5. **More democratic experiences:** In an offline class consisting of 25-30 students, there may be dominant personalities who speak more, and as a result, students may feel shy, inferior, or unmotivated to contribute their thoughts. However, in an online forum, each student is heard, and their comments can be read by everyone who may choose to read.

6. **More time to formulate responses:** In an online discussion forum, the interaction is completely online, which gives the participants time to prepare their answers at their own time when they are ready. Depending on their readiness level, some may answer the questions immediately, or some may consider responding a little later. The answers of the freshers or less experienced students may be based upon reading the discussions of their seniors by revisiting the past discussed topics and critically analysing them.

LIMITATIONS OF DISCUSSION FORUMS

1. **Limited appeal:** The online discussion forums may not appeal to all learners, even in the digital age, especially those with low technological literacy. "Technological literacy" does not only mean being able to operate a computer or a mobile phone but is much more than that like knowledge of advanced software, regular updating with innovations etc.

2. **Digression from the topic:** The discussions within the forums might stray from the main topic without anyone noticing. It becomes very easy for participants to go off topic when so many people are commenting on their own time, and the conversation, in general, might take a turn far from the decided topic.

3. **Management issues:** The success of any online discussion forum depends on how effectively the respective authorities have managed it, and there might be a chance that these forums might not be appropriately managed.

4. **Learner reluctance:** The learners have full control over their participation and interactions in the discussion forums but might still be reluctant to share their views on a public platform as they fear judgemental comments by others.

5. **Limited to written text and images:** One of the biggest disadvantages which an online discussion forum presents is that it is only limited to written texts and images, which can be a problem for those who cannot write or spell, not likely to write, have minimum or limited keyboard skills, have no access to a keyboard, or are living with a disability that hinders them from reading the text or using a keyboard etc.

Discussion forums have emerged as one of the important platforms for communication, interaction, and engagement in the online teaching-learning environment. However, it seems that they are often under-utilised or are unable to have the same result one may aspire to have, like promoting a feeling of belonging and collaborative learning for everyone involved. Limited knowledge of how to use the discussion forums and/or absence of guidelines in effectively engaging a learner can result in students feeling isolated or confused. Likewise, too much use of platforms like discussion forums can overwhelm students.

Creating discussion forums is very easy and can be made by anyone by following some basic steps.

- Here's a quick video of creating a discussion forum on Google Classroom.

  https://www.youtube.com/watch?v=REiH1qhe618

- A quick tutorial on how to create Discussion forums on MS Teams

  https://www.youtube.com/watch?v=iRpe-G6VDVM

Likewise, any platform can be used to create discussion forums, and they can be used optimally to enhance the teaching-learning process.

4.6 Scope and Challenges of Online Teaching and Learning

4.6.1 Scope of Online Teaching-Learning

Online learning is increasingly becoming a popular platform that enables a student to get increased access to education. With the introduction of online learning, the idea of learning has changed dramatically as compared to the old times. The e-learning platform has increased widely since each individual in today's time has a smartphone with a high-quality internet through which the content on the educational websites can be accessed within minutes. One particular report engine like KPMG

published a report stating that by 2021, the number of users in the online teaching learning platform will reach up to 9.6 million.

Keeping in view the rampant advancement in technology and the growing demand for digital education, the government of India, to promote digital education, eased the regulations and directives on online education. This resulted in universities and colleges extending and allowing >20% of a degree online from the year 2020 onwards. This effort has enabled the Indian institutes to improve their standing internationally, especially in higher education.

The increase in digital education has helped the Indian government in improving accessibility in the rural front and providing quality education to all the students in small towns and villages. The advancement in technology has also provided an opportunity to the private players to step into the Indian digital education area.

In a recent study done by the World Economic Forum, it was found that India had the largest number of online course enrolments after the United States, with more than 2,00,000 students. One of the main functions of education is to provide upward mobility. The online certification programs have been able to do the same by providing affordable, good quality education to the masses, which also saves time, money, and energy.

Any particular field of study which offers online learning certification programmes can provide one with increased flexibility and time, resulting in a balance of personal and professional life. Access to these innovative opportunities and global technology helps one achieve a mystery over that particular field. For example, the choice of Digital marketing is fast emerging as a top career choice. People who are creative and want to pursue a self-made career in that particular field can use such certified online courses as part of the online teaching-learning process to gain self-independence and a successful career of their choice.

Three main benefits of using online education for teaching/learning can be summarised as follows:

1. **It is economical and time-saving:** Online education is cheap and cost-effective in terms of money saved on commuting to a specific place to learn like school/colleges/institutions, mass printing of the study material. Online studying saves money and offers opportunities for different business ventures, which cropped up due to online teaching/learning growth. There are various e-learning groups available 24/7, ensuring one can learn at any place at their own convenient time.

2. **Easily managed:** Online learning with its self-paced feature can be managed smoothly even in our tight running schedule. Most e-learning programmes have a time duration that can be extended easily. At the successful completion of a particular course, most online learning programmes enable one to print out a completion certificate, which boosts the morale of an individual/organisation undergoing the e-learning.

3. **Online classroom environment:** There might be a possibility that few learners do not feel comfortable studying in a large group or an organisation. Online learning comes to the rescue here as it allows individuals to act, feel and react according to one's temperament. It gives individuals the liberty to interact and study the modules according to their understanding level and interact accordingly.

4.6.2 Challenges of Online Teaching-Learning

1. **Lack of motivation:** Initially, it was thought the new generation of learners would take online learning as interactive and immersive, but the large no. of texts, quizzes, continuous learning assignments and MCQs have lowered students' inclinations to visit the learning websites frequently.

2. **Inadequate infrastructure:** Although the requirements for massive buildings, spacious classrooms, chairs, tables, and blackboards are not that much in the online teaching-learning process as in a traditional educational setup, this certainly does not mean that there are zero infrastructural requirements in online education. There is a constant huge demand for a good quality bandwidth internet, latest computers, newly updated software, stable electricity connection, power backups etc.

3. **Digital literacy and technical issues:** Even though the new generation of learners might be very good at working on computers, this does not mean they are digitally very literate. Learning skillfully through online education requires a much-advanced knowledge of various latest software and technologies, resulting in a big learning curve.

4. **Lack of real-life interaction:** Humans being social animals, have an innate need for real-life interactions and communications. On the psychological level, online virtual communication can never be an alternative for real, face to face interactions. Real-life presence and classroom interactions lead to an environment that cannot be created by virtual means.

5. **Learning needs of special needs students:** The special needs students have been, to an extent, overlooked in advancing digital education, especially with regards to catering to their individual learning needs. Special needs students need a more individualised and hands-on method of teaching-learning. Even though digital education has seen quite some changes in this regard, special needs students are largely dependent on a real-life instructor to guide them through the learning.

6. **Course structure and quality:** Even after the shift to digital education, it still lags far behind replacing traditional college/university education. Though they have shifted online, these institutions still hold on to their outdated curriculum and core structure. Barring a few tech companies like Google and Tesla who recruit people even without any formal degree, others make it a necessary prerequisite for any formal employment, as a result of which the traditional courses remain a popular choice in contrast to online education.

7. **Lack of accredited degrees from top universities:** Education is more about branding than actual learning in today's competitive times. In such a scenario, online education is yet to make its mark. It has to go a long way to persuade prestigious Institutions to offer their courses through complete online/distance mode. Even though schools have started recognising the online learning system, the higher institutes and government agencies have yet to identify them as a legitimate way of gaining a professional degree.

8. **Distractions and lack of discipline:** Free use of laptops and mobile phones in online classes has resulted in frequent distractions, which in the long run greatly affects the focus of the students in teaching/learning. The accountability, too, is far less in a digital classroom when compared to a real face to face class.

The specific set of challenges faced by Indian students in online learning is available at: https://youtu.be/y_Z5qGMeuB8.

The arrival of the digital age, which ushered in the era of online education, does come with its share of shortcomings, but the benefits far exceed the limitations. If there exists a problem, a solution is also not far behind. The digital education segment is relatively new and has achieved a lot in a very short span of time. The current scenario with regards to digital education is constantly changing with time. It will very soon progress to meet the expectations of the vast community of both teachers and the learners to provide cheap but quality education catering to the diverse needs of the individuals and the community as a whole.

4.7 Ethics for Online Teaching-Learning

According to Collins Essential English Dictionary (2003), "Ethics, in general, is defined as a code of behaviour, usually that of a particular group, profession or individual". Ethics mainly relate to universal and equal access to education by all irrespective of caste, colour, nationality, sex, ideological beliefs, varying disabilities etc. Ethics also embodies the code of behaviour that influences the conduct of the participants in an educational institution. Mutual respect, fairness, cooperation, and tolerance towards one another serve as the base for this code of conduct. It suggests that in a classroom environment, even and especially the virtual classrooms, both learners and the teachers must be informed and act according to the recognised ethical norms resulting in the creation of an educational atmosphere that is suited for enhanced teaching and learning where everyone is familiar with their role and must perform them.

So why the concern for ethics in e-Learning? Apart from the apparent reason that all human ventures necessitate the observance of a few basic norms to excel, the main rationale for including ethics in e-Learning comes from the fact that the vast online community is made up of diverse e-Learners from varying backgrounds, keeping in mind the local as well as international differences. Different learning factors such as age, cultural difference, academic disparities, differing political ideologies, and varying religious backgrounds, mixed with contrasting attitudes towards e-learning, automate that some basic rules should be laid down to ensure that all are on the same wavelength of thoughts. The need for ethics in an online teaching-learning environment also stems from the "psychological barrier" that arises from the lack of real-time face-to-face interaction within an online community of e-learners.

Anderson and Simpson (2007) point that towards the difficulty in dealing with issue of ethical conduct in the online environment as the online discourses transcend the physical and cultural lines. Also, using technology for online teaching-learning processes amplifies the difficulty in monitoring the issue. Hence the teacher's concerns in the traditional classroom relating to students' academic honesty are transferred to the virtual classroom. For example, suppose teachers are worried about whether the

students display academic honesty in the traditional classroom; in that case, that concern is much more heightened in the virtual classrooms where the above mentioned "psychological barrier" increases the possibility of academic dishonesty. Toprak (2010) stated that ethical conduct in e-learning arises from communication ethics and instructional ethics. In an online community of e-Learners, the former (communication ethics) stipulates that the accepted communication protocol amongst all parties is adhered to, while the latter (instructional ethics) attaches the responsibility on the e-Teacher to abide by it accordingly. Ethical considerations in online teaching-learning are obtained from both communication and instructional ethics. Even though the technology and methodology change in an online environment, the nature of the learner does not. The students will remain students and will behave the same irrespective of whether they are virtually present or not. Even though you are teaching at a college/ university level or a lower grade teacher, a good strategy for chalking out various ethics for teaching-learning is necessary to make great learning experiences. Students of any age can start acting up, whether online or in person, and in both cases, they have to be managed appropriately to have a fruitful teaching-learning experience or else one may have students sending inappropriate messages, harassing one another, disturbing the lecture, or they could be just sitting disoriented in the classroom.

CODES OF ETHICS IN ONLINE TEACHING-LEARNING COMMUNITIES

The codes of ethics pertinent to online teaching-learning or virtual communities can be broadly classified into two types – explicit and implicit, as iterated by Gurãu (2011).

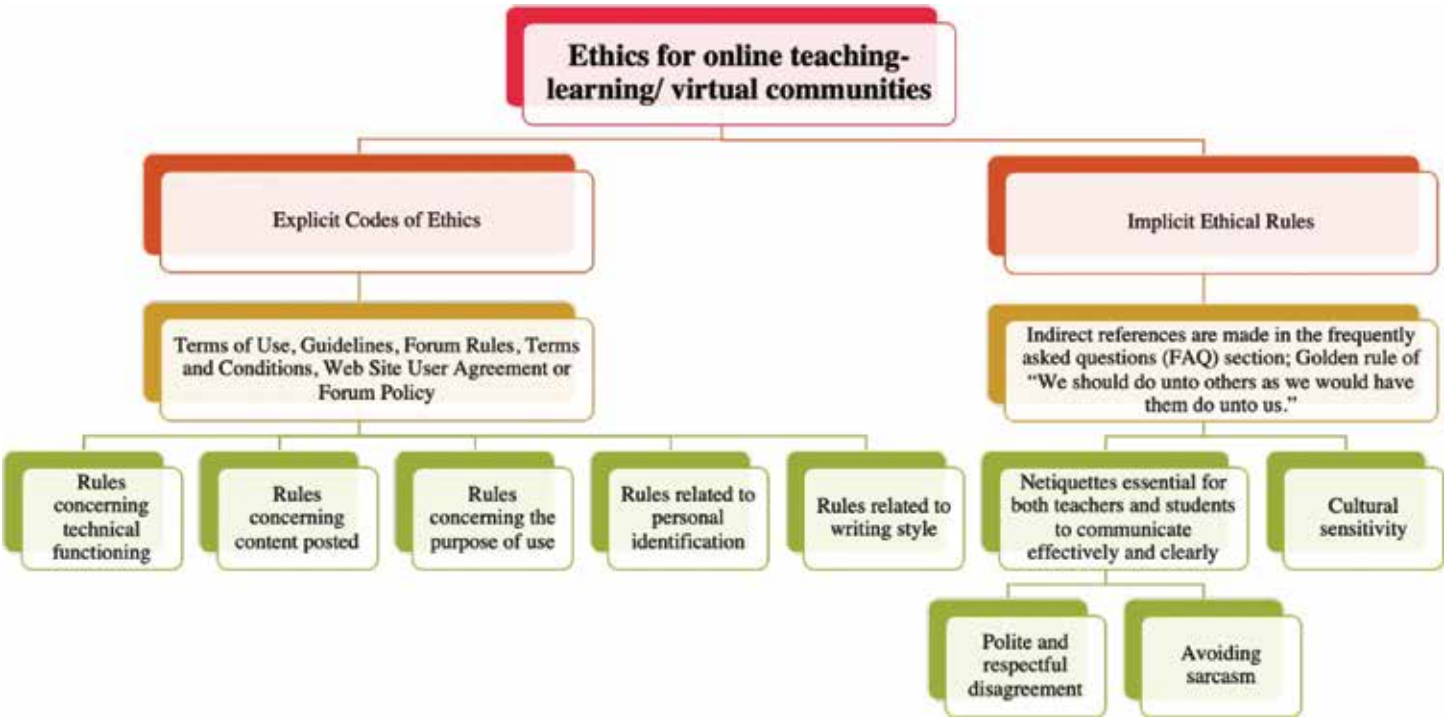


Fig.4: Ethics of online teaching-learning

1. **Explicit Codes of Ethics:** The term 'explicit' means something that is clearly stated or expressed with no room for doubt or confusion. Essentially, the explicit codes of ethics are rules that include formally stated guidelines of the group that a member should abide by as soon as s/he becomes a

part of the group. According to Gurău (2011), explicit codes of ethics can be in the form of "Terms of Use, Guidelines, Forum Rules, Terms and Conditions, Web Site User Agreement or Forum Policy" which may(not) include legal disclaimers (p. 23). For instance, in Facebook, the "Group rules' section appearing under the 'About' information tab informs the members about the guidelines they need to adhere to in order to conduct themselves ethically within the group.

The explicit codes of ethics could include rules related to good technical functioning of the group, content that could be posted, purpose of use, personal identification, and writing style (Gurău, 2011).

2. **Implicit Ethical Rules:** The term 'implicit' means something not stated or expressed but is supposed to be understood or implied. Unlike the explicit codes of ethics, the implicit codes of ethics are not stated or expressed, which may lead to unnecessary speculation, doubt, and divergence from the intended meaning. At their own free will, the members may generate meaning and gather insights about expectations from them from the interactions taking place within a group and then conduct themselves likewise to appear 'socially acceptable'. Regarding implicit ethical rules, Gurău (2011) provides that,ethical rules that have to be respected by forum members; however, indirect references are made in the frequently asked questions (FAQ) section regarding the possibility of censoring members' messages by replacing specific words with a string of "*." In other sites, the ethical rules are limited to a general principle or "Golden Rule," such as "We should do unto others as we would have them do unto us," from which the members can derive the desirable rules of ethical behavior. (p. 23)

The implicit codes of ethics could encompass the netiquettes and the cultural sensitivity expected of the group members for meaningful interactions and constructive discussions to occur.

SUGGESTIVE CODES OF ETHICS FOR ONLINE TEACHING-LEARNING

For teachers: The ethical code of conduct which a teacher should be considerate of, especially in online teaching-learning, can be summarised as follows:

- Setting up a firm and effective teacher presence in the online classroom
- Communicating clearly and effectively the learning expectations from the students.
- Facilitating online learning discussions and other course requirements regularly and on time.
- Develop expertise tools to provide efficacious assistance to the learners for online teaching-learning.
- Pooling in updated ideas from various sources and adding to the existing information shared on the online learning platform.
- Taking initiatives to encourage student-to-student collaboration and motivating students to prepare creative content for online teaching and learning.
- Respecting students' privacy and avoiding disruptive, overly critical, or defamatory remarks against the students while ensuring students' online safety.

- Act in strict accordance with the ethical model of behaviour, comply with the copyright laws, and give proper citation to the work of others wherever necessary.

For students: The code of ethics to be followed by the online learners can be outlined as follows:

- Fruitful participation in the online discussions forums and learning new skills frequently to update one's learning.
- Taking part in online discussions with meaningful ideas and information and at the same time being considerate about other viewpoints and opinions too.
- Creating an online environment that encourages creativity and takes the help of others engaged in the teaching-learning process to contribute towards knowledge creation actively.
- Treat the teacher and fellow peers involved in the teaching-learning process with the utmost respect and be courteous.
- Thinking well before conveying one's thoughts and avoiding dismissive, defamatory, belittling words that could hurt the individuals' sentiments.
- Providing analytical feedback, useful information, and posting thoughts and comments timely on the online platform given to help fellow classmates analyse and assess knowledge regularly.
- Being supportive of the group's diversity and allowing everyone to speak and participate effectively in the online teaching-learning platform irrespective of their background.
- Maintaining honesty in your representation in the group, abiding by copyright laws, giving proper references wherever required, and timely submitting the work as mandated by the instructor.

The swift and constant evolution of technology coupled with cyberbullying brings up many challenges in online teaching-learning thereby necessitating the presence of an effective code of ethics. In this regard, cooperation and honest performance of all the people involved in the online teaching-learning process would make learning more effective and thus, contribute to successful e-education. Since online education is an area of sustained growth accompanied with continuous change, it generates new and peculiar challenges to the model of online academic rectitude and hence entails that the code of ethics to be followed in online teaching-learning should not be considered as fixed in stones and need to be often remodelled keeping in line with the change in technology and the consequent issues arising out of it.

4.8 Sharing of Digital Content – Indian Initiatives

In the Indian landscape, the government has taken several initiatives to ensure learning occurs at the pace and convenience of learners beyond the four walls of a classroom. These initiatives seek to help learners enrol for various programmes, access learning materials, and learn through technologies. They include e-Pathshala, DIKSHA, National Repository of Open Educational Resources (NROER), National Programme on Technology Enhanced Learning (NPTEL), e-PG Pathshala, SWAYAM and SWAYAM Prabha, NISHTHA, etc.

1. **FREE AND OPEN-SOURCE SOFTWARE FOR EDUCATION (FOSSEE)** (http://fossee.in) is a project undertaken by the Govt. of India (GoI) as part of the National Mission on Education through Information and Communication Technology (NMEICT). It seeks to enable open-source software in educational institutions to promote academia and research. Through the open-source software, an effort is made to reduce dependence on proprietary software in educational institutions. Essentially, the open-source software allows the users to define, study, modify, and distribute the source code of the software to anyone for any purpose. Under the FOSSEE project, several projects have been taken by GoI, including Scilab, Python, eSim, Osdag, DWSIM, OpenFOAM, OpenModelica, OpenPLC, FLOSS Arduino, Single Board Heater System, R, QGIS, FOCAL, and SOUL. A vast array of instructional material is available in the form of textbook companion, lib migration, niche software activities, forum, and workshops and conferences.

2. **SPOKEN TUTORIAL** (https://spoken-tutorial.org/) platform facilitates self-training in the IT fields without the physical presence of an instructor. The 10-minute audio-video tutorials related to open-source software are available in 22 languages and focus on programming languages such as C, C++, Java, PHP, PERL, Scilab, Python, Osdag, DWSIM, OpenFOAM, OpenModelica, LibreO, etc.

3. **PM eVIDYA** (https://pmevidya.education.gov.in/) is a comprehensive initiative introduced by the Govt. of India (GoI) in May 2020 in the wake of the pandemic. The programme seeks to contribute to the Atma Nirbhar Bharat Programme by unifying and converging all the digital/online/electronic/on-air educational efforts for designing e-content and activities to benefit a massive base of ~25 crore school students, including children with special needs (CWSN). Ideally, the programme seeks to make e-learning accessible to students and teachers in coherent and multi-modal ways and build and strengthen digital education. Under its flagship, the programme subsumes DIKSHA (Digital Infrastructure for Knowledge Sharing), earmarked TV channels class-wise, radio community and Shiksha Vani, and DAISY (Digitally Accessible Information System).

   a. ***DIKSHA*** (https://diksha.gov.in/): The GoI introduced this national portal developed by the National Council for Education Research and Training (NCERT) in September 2017. The states/UTs subsequently implemented the initiative to support school education through the internet. The 'One nation: One digital platform' initiative is based on open-source technology with the underlying core principles of open architecture, open access, open licensing diversity, choice, and autonomy. As per the school-based curriculum, the portal offers overarching engaging e-content and learning materials in 32 Indian languages to students, teachers, and parents. The content is primarily published by NCERT, CBSE, NIOS (The National Institute of Open Schooling), and 22+ states and UTs. The content hosted on the portal is available through the website and mobile application (only for android users). All learners can access the designed e-content via radio/podcasts, and QR-code energised digital textbooks for school students (Classes 1 to 12). The portal also offers practice worksheets, quizzes, question banks, and other modalities to assess student learning. For differently-abled learners, the portal offers Universal Design of Learning (UDL) based on curricular Content in Indian Sign Language (ISL), audiobooks, and DTH channels for hearing impaired learners. Apart from school curriculum-based content, the portal also subsumes the NISTHA (National Initiative for School Heads and Teachers' Holistic Advancement) that hosts educational and training resources to support the

continuous professional development of teachers and school heads. The step-by-step process of installing, registering, and accessing e-content, courses, TV classes, library, discussions, chatbot, etc., available on the DIKSHA portal is exhaustively discussed with supporting screenshots on the website (link: https://diksha.gov.in/help/getting-started/diksha-mobile-app/install-and-signup.html)

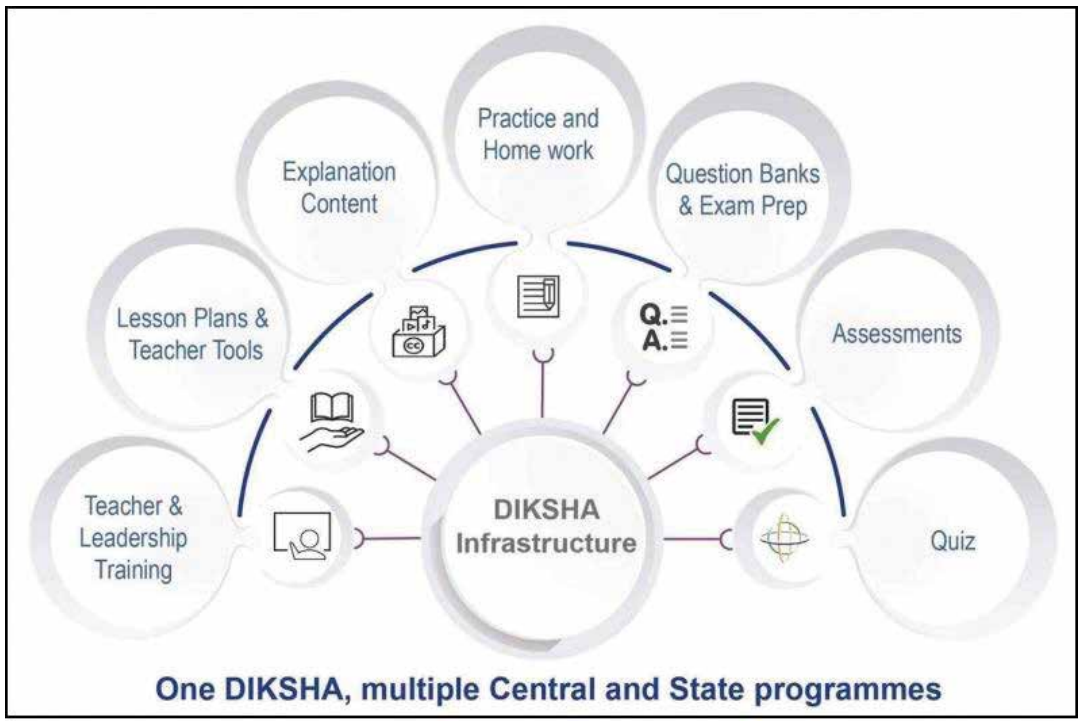


Fig.5: DIKSHA components (Source: https://diksha.gov.in/about/)

b. TV channels for all classes: The GoI offers multiple TV channels for different levels of education to ensure the availability of quality content to support continuous learning for those who do not have access to the internet. The TV channels air educational content spanning diverse disciplines class wise 24/7. For instance, Swayam Prabha (link: https://www.swayamprabha.gov.in/index.php/home), launched in 2017, is a group of 34 channels including 22 DTH (direct to home) channels from which 12 channels exclusively focus on school education, that is one for each class level. These channels air new content every day for at least 4 hours and then repeat the same content the rest of the day to allow learners to learn conveniently. Through live sessions, the students can interact with the experts and seek explanations about their doubts. The broadcasted content is tagged with a QR code that redirects the student to the linked chapter on the DIKSHA portal and facilitates asynchronous usage.

c. Radio community and Shiksha Vani: In remote areas with no internet connectivity and an erratic electricity supply, the use of radio broadcasts ensure continuous and quality learning for students (especially for grades 1 to 5). As per the India Report - Digital Education (2021), "289 Community Radio Stations have been used to broadcast content for NIOS for grades 9 to 12. 1995 pieces of curriculum-based radio programs (Classes 1 -8) and 06 for class 10 produced

by CIET-NCERT for its dissemination on 226 Radio Stations (132 All India Radio Stations, 18 GyanVani FM Radio Stations, and 76 Community Radio Stations) have been broadcasted" (p. 12). Also, the Shiksha Vani app has been developed as a podcast app by the CBSE to enable clear, transparent, and prompt broadcasting of vital information, news, events, and recent developments to students and parents. The app is presently available for download only on the google play store and caters to learners of grades 9 to 12. Upon opening the app, a user is redirected from the landing page to the app's home page; after that, s/he can choose interactive tabs (recent, regional officers, teachers, principals, students, etc.) to find pertinent and recent information. A user may choose to receive notifications through SMS as well.

d. **DAISY (*Digitally Accessible Information System*)** publishing system is internationally dedicated to visually impaired students. The study material (audiobooks, periodicals, computerised text, is primarily in three forms - digital talking books, text-only books with braille displays, and Cadillac DAISY books containing full-text, full-audio. The DAISY Forum of India (https://daisyindia.org/) serves as an online library for the visually impaired and produces and distributes books and reading material in accessible formats.

4. **SWAYAM (STUDY WEBS OF ACTIVE LEARNING FOR YOUNG ASPIRING MINDS)** was introduced in 2017 by GoI to facilitate online, lifelong learning (link: https://swayam.gov.in/) based on three cardinal principles of education – access, equity, and quality. The platform seeks to provide high-quality learning content through Massive Open Online Courses (MOOCs) at an affordable cost to all the students, teachers, non-student learners, and especially the underprivileged section. The courses available on the integrated platform relate to various subjects for students (from Class 9-12 to undergraduate and postgraduates). A detailed discussion on MOOCs is present at section 4.9.3 of this module.

5. **E-PATHSHALA PORTAL** (https://epathshala.nic.in/) was developed by NCERT and launched in 2015 to provide a storehouse of educational resources (videos, audios, flipbooks, epubs, etc.) The educational resources on the portal are easily accessible and multilingual (available in Hindi, English, and Urdu). The resources can be accessed with the help of an app (Android, iOS, Windows) that users can install on smartphones, laptops, desktops, and tablets. At present, the portal hosts QR code enabled 504 e-textbooks (classes I to XII) and 3886 e-resources that may be accessed by the students, teachers, teacher educators, and parents.

6. **E-PG PATHSHALA** (https://epgp.inflibnet.ac.in/) is an initiative under the NMEICT to facilitate gateways to postgraduate courses. It is being executed by the UGC (University Grants Commission). It offers high quality, interactive e-content in 70 subjects across all social sciences, arts, fine arts and humanities, natural and mathematical sciences, linguistics, and languages. The video content in the form of lecture series is available on the YouTube channel (link: https://www.youtube.com/channel/UCgNgdBmRmUFG2SPTyQ5WRUg). The initiative, per se, includes three verticals:

   a. **e-Adhyayan** (http://epgpbooks.inflibnet.ac.in/eadhyayan/) platform provides access to 700+ e-books derived from the e-text of e-PG Pathshala for the postgraduate courses along with the video content.

b. **UGC-MOOCs** (https://swayam.gov.in/), as a vertical of SWAYAM, is dedicated to curating courses for postgraduate subjects. UGC is one of the national coordinators of SWAYAM for producing and delivering the best quality educational content, and INFLIBNET is the technical partner for hosting the content. A detailed discussion about MOOCs is presented at section 4.9.3 of this module.

c. **e-Pathya** is the third vertical of e-PG Pathshala. It is primarily a software-driven course/content package that facilitates students pursuing higher education (PG level) in distance learning and campus learning mode. It also facilitates offline access.

7. **NATIONAL DIGITAL LIBRARY (NDL)** is a pilot project under the NMEICT to develop a framework of virtual repository of more than 3 crore digital learning resources in all major education domains with a single-window, filtered and federated search facility to facilitate focused search outcomes within minimum time. The pilot project is developed at the Indian Institute of Technology Kharagpur. The repository is equipped to hold content of any language and supports all academic levels, including researchers and life-long as well as differently-abled learners. The NDL has a large active user base and is available through the website (https://www.ndl.gov.in/) and mobile app. It helps students prepare for competitive exams, learners of all age groups to learn from the best practices of others, and "facilitates researchers to perform inter-linked exploration from multiple sources." (ICT Initiatives of MHRD, 2020, p. 1).

8. **NATIONAL REPOSITORY OF OPEN EDUCATIONAL RESOURCES (NROER)** (link: http://nroer.gov.in/) is an online repository developed by the Central Institute of Educational Technology (CIET), NCERT, launched in 2013. It is a storehouse of e-content (videos, images, audios, documents, and other interactive materials) for students of classes I to XII, teachers, teacher educators and parents. The repository is a collaborative effort of NCERT, SCERT, SIERT, SIE, Vigyan Prasar, CCERT, Gujarat Institute of Educational Technology (GIET), SIET and other stakeholders. The e-content is also available on the official YouTube channel of NCERT (https://www.youtube.com/c/NCERTOFFICIAL).

9. **OLABS** (http://www.olabs.edu.in/) is an initiative of the Ministry of Electronics and Information Technologies, GoI. The portal is dedicated to school-level experiments carried out by the students of classes 9 to 12 in Physics, Chemistry, and Biology Labs. The portal also hosts English and Maths lessons for classes 9 and 10. The labs can be made available to students remotely, bridging the digital divide and geographical distances. The portal facilitates teaching experiments to students via simulations over the internet efficiently and cost-effectively through an interactive interface. The experiments can be accessed anytime, anywhere at the learners' convenience and viewed again and again to gain conceptual clarity. The portal also has the option of assessing learners' procedural understanding and manipulative skills through the experiment. The development of OLabs includes the study and use of mathematical techniques to demonstrate the various complex functions in diverse areas of science. Also, real lab scenarios are demonstrated through live experiments that entail authentic learning.

10. **VIRTUAL LABS** project (https://www.vlab.co.in/), as an initiative of GoI under the NMEICT, was introduced in pilot mode in 2009 and the main one in 2010. Twelve institutes partnered to develop the platform to facilitate the paradigm shift to ICT-based education in science and engineering courses). It enables undergraduate and post-graduate students to access the labs and conduct

remote experimentation. This enhances the learners' study experience and reduces the burden of institutes that do not have good labs and instruments. Also, no additional infrastructural setup is required for using the platform, and simulation-based experiments can be accessed via the internet. The virtual labs offer students a Learning Management System and various study aids such as video lectures, web resources, self-evaluation, and animated demonstrations.

11. **SHODHGANGA** (https://shodhganga.inflibnet.ac.in/) is a reservoir of Indian theses maintained electronically and freely accessible to all citizens. Students, teachers, researchers, educators, and academicians can explore the reservoir to gain in-depth information, knowledge and research findings concerning areas of interest. It is an open-source digital repository that provides a platform for research scholars to deposit their Ph.D. theses and make them available to the entire scholarly community.

12. **E-SHODHSINDHU** (https://ess.inflibnet.ac.in/) provides subscription-based access to scores of peer-reviewed journals, and bibliographic, citation and factual databases concerning different disciplines indexed by different publishers to member institutions (universities and colleges).

13. **NATIONAL DIGITAL EDUCATIONAL ARCHITECTURE (NDEAR)** (https://www.ndear.gov.in/) was launched in 2021-22 by the GoI to provide a unified, national digital infrastructure and advance and strengthen it for both energising and catalysing the education ecosystem and support activities related to education planning. Through NDEAR, the govt., as an enabler and facilitator, would provide a framework or common set of principles that support building, re-building, using, and re-using technology for education. This would enable the states/UTs to evolve customised technology solutions and maintain autonomy. Basically, NDEAR is "federated, unbundled, interoperable, inclusive, accessible, and evolving which aims to create and deliver diverse, relevant, contextual, innovative solutions that benefit students, teachers, parents, communities, administrators and result in timely implementation of policy goals" (NDEAR website, https://www.ndear.gov.in/). It is essentially a coherent, multi-channel, multimodal learning continuum to help students, teachers, administrators, parents, and the school community to learn anytime, anywhere. The NDEAR is constituted of 36 building blocks within 12 categories.

14. **SARANSH** (https://vikaspedia.in/education/online-assessment/saransh), an initiative by CBSE, is a platform that allows CBSE affiliated schools and students' parents to undertake a comprehensive self-review and analysis. It enables analyses of students' performance to take timely corrective action, although it is available only for classes 9 to 12. Together, the parents and teachers can track the performance of students and monitor their progress to help them improve. The platform allows for data-driven decision-making at the school level.

15. **SHAGUN SHALA GUNVATTA** (https://repository.education.gov.in/) is an interactive digital repository that has documented rich content related to best school practices, case studies, success stories, images, testimonials, and other innovative developments initiated across states/UTs of India based on Samagra Shiksha components.

16. **E-YANTRA** (https://new.e-yantra.org/) project is dedicated to providing effective education on embedded systems and Robotics across engineering colleges through open-source content to harness the talent of young engineers to arrive at technology solutions across different domains. The training for teachers and students is imparted through workshops where participants are taught the basics of embedded systems and programming.

4.9 Modalities of Online Teaching-Learning – An Overview

With the explosion of ICTs, there is a wide array of channels and modes through which learning can occur as per the pace and convenience of the learner. Emerging technologies have paved the way for transcending the basic learning that occurs within traditional classrooms and set the tone for explorative, interactive, and collaborative learning. This has led to learners becoming more independent with what they learn and how they learn as they get to decide the depth of learning in each area of interest.

Furthermore, the shift to online education has questioned the primordial ways of teaching. Any instructor or teacher has to carefully plan the course chosen for teaching online as several factors need to be considered lest mere content transaction through web-based lectures would amount to "slapping classroom content online" (O'Neil, 2014). For effective online learning, an instructor needs to carefully first see who the learners are then select such a platform that allows for sharing of content while keeping in mind the learners' needs, consider the type of communication the platform would entail, ensure the platform supports different mechanisms for assessment and feedback thereto, and quintessentially the value the course would add to learners' life.

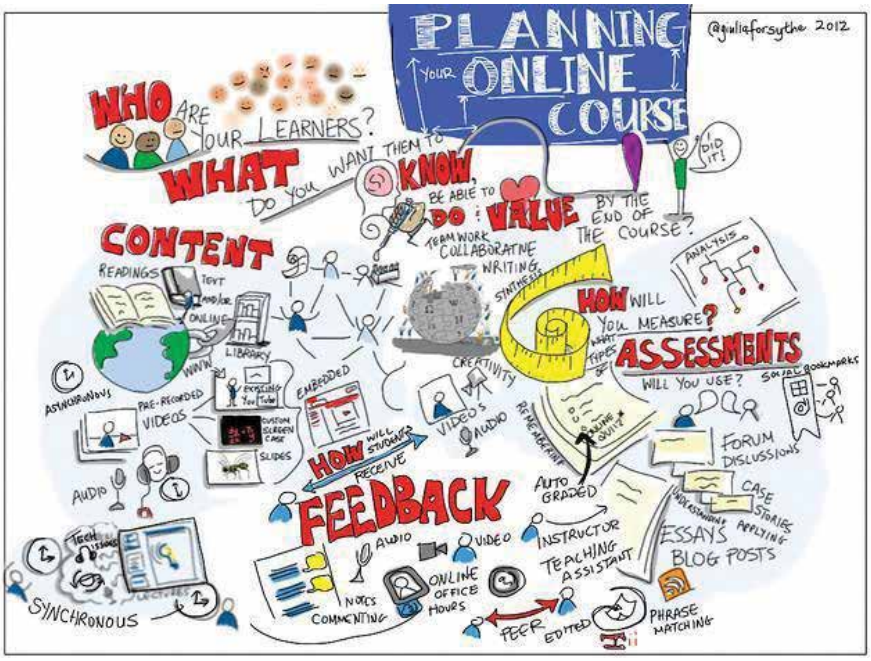


Fig. 6 Planning Your Online Course v2 by giulia.forsythe is licensed under CC0 1.0

In view of planning considerations related to online teaching, several platforms have emerged that seek to make online learning a truly authentic experience by offering several features under one roof. Among a host of modalities available for facilitating online teaching-learning, this particular module focuses on the role of learning management systems, open educational resources, and massive open online courses.

4.9.1 Learning Management Systems (LMS)

There is no questioning the fact that the technological age has drastically changed the way people access education in modern times all across the globe. In the age of globalisation coupled with rampant

technological advancements, the traditional method of teaching/learning occurring in a rigid physical classroom of an institute or college is increasingly becoming less and less effective and relevant. Modern-day learners are increasingly becoming discontented with the chalkboard methodology of teaching-learning that is more rigid in terms of time, space, and distance.

With the surfacing of sophisticated communication technology, a new group of consumers seeking the latest information are now able to come together to share ideas and information without actually having to meet in physical form. In light of this, software developers and vendors (including open-source developers) as well as educational institutions have evolved or adopted systems to manage courses in online mode and communicate with students spread geographically. Essentially, learning management systems (or LMSs) refer to those technologies that facilitate the provision of courses over long distances. With the advent of internet, nowadays learning management systems primarily refer to web-based software platforms that provide an interactive online learning environment and automate the administration, organisation, delivery, and reporting of educational content and learner outcomes. The term 'LCMS' also often occurs; however, the two should not be confused. While the latter stands for "learning content management system", the former (LMS) is much wider in scope and coverage, like tracking learners' progress through online courses.

Some of the most commonly used LMS platforms include Moodle, Blackboard Learn, Schoology, MOOCs platforms, Kahoot, NEO LMS, Mintbook, Paradiso LMS, etc.

HISTORY OF LEARNING MANAGEMENT SYSTEMS (LMS)

If we talk about the origin or history of learning management systems, it can be traced back to the existing distance education system. Countries such as Australia, with a geographically scattered population, worked on initiatives to provide education to the learners who could not attend the formal schooling system. Before the internet, the Australian agencies used a mailing system to cater to the educational needs of the students. In 1920s, Sidney Pressey floated the concept of "learning machine", "a device that could administer questions through a window prompting the user to select a response out of four choices, that spurred the development of the first online LMSs" (Turnbull , Chugh, & Luck, 2020, p. 1053). Whatever it was, the education providers knew that they would have to adjust to the new online world created now with the fast-emerging internet technology, which completely changed the way people communicated with one another.

The earliest versions of electronic LMSs were little more than a platform for online distribution of learning content and could be broadly be categorised as:

1. ***Proprietary source:*** WebCT was one of the first proprietary systems developed by the University of British Columbia in 1995 (Turnbull , Chugh, & Luck, 2020). Various research studies suggesting that learning can be enhanced by using web-based resources led to the invention of WebCT as an online learning platform.

2. ***Open source:*** Open-source systems, on the other hand, were created collaboratively by software experts with the intent to make the source code freely available to colleges/institutions and individuals.

FEATURES THAT MAKE A GOOD LMS

1. ***Course Management:*** The course management features of an LMS enable distribution of high-quality and relevant content and instructional resources to the enrolled learners in a timely manner. Often, a teacher or an educator discharges various roles such as that related to content management and control, class scheduling, etc.

2. ***Assessment:*** Assessment is one of the most important features of LMSs. An LMS must perform tasks such as collecting data, storing it easily and accessing the stored data. It should also be able to do assignments, provide feedback to the learners, etc. The Assessable data can comprise assignments, tests, and projects.

3. ***Tracking Progress of the learners:*** Withdrawal from a current program remains one of the major concerns for the colleges/institutes due to a lack of personal face to face interactions. Hence, a good LMS should enable tracking of the user engagements in a course, including features like frequency of logs, time spent on the course, communication, and downloads per user.

4. ***Gradebook:*** Within a LMS, the gradebook functions aid in disseminating the assessment information to the learners and their parents in a prompt manner. It includes individual assessment results, instructor feedback, and student attendance.

5. ***Communication Tools:*** A LMS has the capabilities to facilitate both synchronous and asynchronous communication. Asynchronous tools, such as e-mail, discussion boards, and Wikis, allow for one-way communication whereas synchronous tools facilitate two-way communication and allow for real-time exchange of information and knowledge.

6. ***Social Connectivity:*** A good LMSs should create a social environment on an online platform, including features like discussion forums, live chats, and videoconference tools. Some LMSs even have features that monitor learner interactions with communication.

7. ***Security and Privacy:*** Key security features in LMSs should include user authentication, access verification, password integrity controls, and intruder detection. Privacy measures are also necessary to ensure that sensitive information is made available to the intended recipient(s) only.

THE FUTURE OF LMSS

Seeing the current developments in technology, the constantly evolving nature of teaching/learning and the current teaching methods becoming more student-friendly, it becomes clear that the LMS in the future will evolve from just a helping administrative tool to much more. As the bandwidth, storage, and mobile device computing capacity improves, the power of LMSs to meet the new emerging demands will improve subsequently. It can be predicted that the future developments in LMS technology will more likely include highly sophisticated tools which will result in authentic sync interactions and communications like videoconferencing apps and peer-to-peer messaging.

4.9.2 Open Educational Resources (OERs)

Open educational resources (OERs) refer to those educational resources that allow the users to use, modify, and share the contents with or without permission from the source. The term OER was

first coined in 2002 at a forum organised by the UNESCO on Open Courseware in Higher Education. According to UNESCO (https://en.unesco.org/themes/building-knowledge-societies/oer),

Open Educational Resources (OER) are teaching, learning and research materials in any medium – digital or otherwise – that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation, and redistribution by others with no or limited restrictions. OER form part of 'Open Solutions', alongside Free and Open-Source Software (FOSS), Open Access (OA), Open Data (OD) and crowdsourcing platforms.

Butcher (2015) defines OERs as "any educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are openly available for use by educators and students, without an accompanying need to pay royalties or licence fees" (p. 5).

According to the OER Commons website (https://www.oercommons.org/about), the open education practice

"leverages open education resources (OER) to expand the role of educators, allowing teachers to become curators, curriculum designers, and content creators. In sharing teaching tools and strategies, educators network their strengths and improve the quality of education for their students. With an open practice, educators are able to adjust their content, pedagogies, and approach based on their learners, without the limitations of "all rights reserved"."

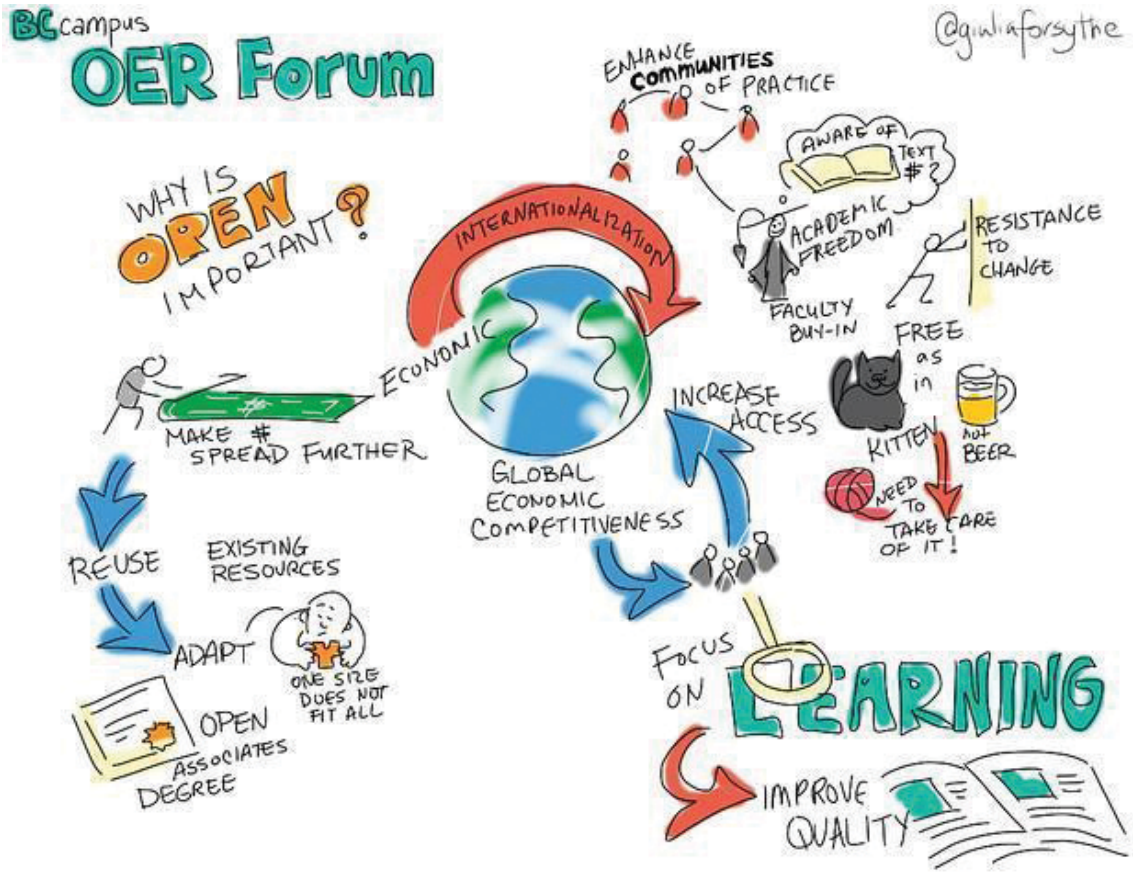


Fig.7 Why is Open Education Important? by giulia.forsythe is licensed under CC0 1.0

Therefore, OERs is ideally a broad term that encompasses teaching, learning, and research materials that may or may not be in digital format. The OERs may reside in the public domain or be subject to an open license that permits users to use the contents according to the five R's given by Wiley (1998). The OERs may be in the form of lesson plans, curriculum maps, learning modules, e-textbooks, videos, audios, images, assignments, worksheets, library resources, course design templates, etc.

HISTORY OF OERs

The origins of open educational resources can be traced to the term 'open content' coined by David Willey in 1998 that specifically focused on what content is essentially open and the extent to which it may be repurposed. Thereafter, the UNESCO's 2002 Forum on the Impact of Open Courseware for Higher Education in Developing Countries led to the evolution of the term 'open educational resources'. Meanwhile, in 2001, the Massachusetts Institute of Technology undertook the major MIT Open Courseware (OCW) project based on how the internet would be in education and the current status-quo of universities in leveraging it for education. Over the years, this led to the development of materials from 2150 courses and 125 million visitors at www.ocw.mit.edu. Parallelly, Wikipedia and Creative Commons emerged with William and Flora Hewlett Foundation Support leading the OER movement.

The basic principle underlying the OER movement is the human right to access to high-quality education that seeks to facilitate access to openly licensed educational resources/content to learners across the globe, which, in turn, entails cost savings, diverse learner participation, immersive experience through collaboration in teaching and learning, and co-creation of the content (OER Commons website, https://www.oercommons.org/about). In this way, the OER movement provides a connected, collaborative, and innovative learning scheme.

CHARACTERISTICS OF OERs

1. ***Digital:*** The explosion of ICTs has led to a paradigm shift in educational practice that has digitised the learning space with materials that can be electronically disseminated. Although the concept of OERs in the form of library resources has existed for a while, the ICTs have significantly increased access to several global resources like course materials, lesson plans, podcasts, videos, etc., that may be distributed freely, especially for educational purposes. Also, the OERs support easy customisation of the resources to suit the contextual needs of the educators and students.

2. ***Open License:*** The OERs are governed by any license the content creator may attach. While most of the OERs available in the public domain are freely accessible and provide easy use with/out reference to the parent source, other sources may come under the purview of licensing options entailed by the legal framework. The 5 R's by David Wiley – retain, revise, remix, reuse, and redistribute- provides what is open as per the license attached with the OER.

3. ***Low cost:*** The OERs are mostly available free of cost or at a nominal price which ensures that everyone can learn; that is, financial constraints should not limit access to high-quality education. Significant monetary resources are invested in purchasing textbooks, whereas OERs reduce this burden on the students and educators. Also, the OERs expand access to education by allowing remote electronic access to learners located in remote locations.

OERs V. E-LEARNING, OPEN LEARNING/EDUCATION, RESOURCE-BASED LEARNING

OER is not the same as e-learning. While OERs relate to openly licensed content that may be available in different mediums – paper-based text, video, audio or computer-based multimedia, e-learning courses are essentially digitised and may include OERs (Butcher, 2015). In a nutshell, neither all OERs are e-learning, nor all e-learning is through OERs, although each may support the other to facilitate 24/7 learning.

Open learning or education as an approach to learning seeks to remove the barriers to learning wherein OERs serve as one of the ways to provide access to educational resources so that each learner has an equal chance to succeed at learning as per their specific needs in multiple areas of learning (Butcher, 2015).

Also, often OERs are confused with resource-based learning. Prima facie, there is "no direct relationship between OER and resource-based learning. Many courses and programmes at all levels of education now incorporate extensive use of instructionally designed resources, as educators have learned the limitations of lecture-based strategies for communicating information to students. It uses fully copyrighted materials rather than OER" (Butcher, 2015). Thus, resource-based learning is essentially based on copyright materials. In contrast, OERs are based on the 'copyleft' perspective that assumes people are inherently good and a sustainable healthy culture is necessary to support the shift to open educational practice.

OER LICENSING

What can be licensed

Educational resources, scholarly articles, images, movies, videos, music, books, comics, journalism, presentations, lecture notes, games, databases, data, websites, blogs, etc.

The 5 Rs of OER

David Wiley's 5 Rs of OER determine what resources are "open" and the extent to which they are open. If a resource is available publicly, it in no way conveys that others may use it in desired ways and thus, the need for a legal framework arises to determine the kind of use. According to Wiley, the permission to use any open resource is granted in advance through a legally established framework (1) Creative Commons copyrights or any other legal system that provides free and perpetual permission, or (2) the resource is in the public domain that allows the user to engage in 5R activities that include:

1. ***Retain*** - The user can make, own, and control copies of the content or resource (e.g., download, duplicate, retain, store, and keep your copy as an instructor, student, or author).
2. ***Revise*** - The user can edit, adapt, and modify his/her copy of the resource (e.g., translate to a different language, add content relevant to the context, alter the format or contents, etc.).
3. ***Remix*** - The user can combine the original or revised copy of the resource with other existing material to create something new (e.g., make a mashup).

4. ***Reuse*** - The user can use the original, revised, or remixed copy of the resource publicly without explicit permission (e.g., on a website, in a presentation, in a video or podcast, in a class).

5. ***Redistribute*** - The user can share copies of the original, revised, or remixed version of the resource with others (e.g., post a copy online, share in communities, review, and modify the existing work and share it publicly, or give one to a friend).

This material is an adaptation of Defining the "Open" in Open Content and Open Educational Resources, which was originally written by David Wiley and published freely under a Creative Commons Attribution 4.0 license at http://opencontent.org/definition/.

Creative Commons

Creative Commons is one of the most popular licence providers of texts, videos, audio, pictures, etc., although it is not the sole provider. It offers a diverse set of licensing options that essentially seek to forge a balance inside the traditional "all rights reserved" setting that copyright law creates and copyleft afforded by the open licensing options. It is one of the standardised ways to grant copyright permissions to creative work. The licenses offered are:

1. Attribution, CC BY: According to Creative Commons, "this license lets others distribute, remix, adapt, and build upon your work, even commercially, as long as they credit you for the original creation. This is the most accommodating of licenses offered. Recommended for maximum dissemination and use of licensed materials."

2. Attribution-ShareAlike, CC BY-SA: According to Creative Commons, "this license lets others remix, adapt, and build upon your work even for commercial purposes, as long as they credit you and license their new creations under the identical terms. This license is often compared to "copyleft" free and open-source software licenses. All new works based on yours will carry the same license, so any derivatives will also allow commercial use. This is the license used by Wikipedia and is recommended for materials that would benefit from incorporating content from Wikipedia and similarly licensed projects".

3. Attribution-NoDerivs, CC BY-ND: According to Creative Commons, "this license lets others reuse the work for any purpose, including commercially; however, it cannot be shared with others in adapted form, and credit must be provided to you."

4. Attribution-NonCommercial, CC BY-NC: According to Creative Commons, "this license lets others remix, adapt, and build upon your work non-commercially, and although their new works must also acknowledge you and be non-commercial, they don't have to license their derivative works on the same terms."

5. Attribution-NonCommercial-ShareAlike, CC BY-NC-SA: According to Creative Commons, "this license lets others remix, adapt, and build upon your work non-commercially, as long as they credit you and license their new creations under the identical terms."

6. Attribution-NonCommercial-NoDerivs, CC BY-NC-ND: According to Creative Commons, "this license is the most restrictive of our six main licenses, only allowing others to download your works and

share them with others as long as they credit you, but they can't change them in any way or use them commercially."

An overview of how to use Creative Commons content is available at: https://youtu.be/1OULrgm4iW4, and a description of various licences is available at: https://youtu.be/srVPLrmlBJY.

BENEFITS OF OERs

1. ***High-quality materials for all:*** OERs can provide access to high-quality learning materials to all learners at low or no cost by reducing or removing royalty payments for textbooks and other educational materials. In turn, this significantly reduces time consumption and provides broad outreach by transcending physical boundaries and creating a global learner base; thus, OERs ensure equal access to knowledge.

2. ***Adaptation and reproduction:*** Based on the licence attached with any OER, the adaptation and reproduction of contents change. OERs allow flexibility to retain, reuse, modify, or remix the content and may or may not be used for commercial and derivative purposes. This licensing option allows the user to make the content culturally relevant to the learners, thus making it more effective. Teachers, educators, and students can also contribute to creating the content, emphasised by National Education Policy 2020, and move from mere consumers to prosumers of knowledge.

3. ***Builds competence in knowledge production:*** Educational institutions can develop OERs necessary for carrying out their respective instructional design, which, in turn, can lead to the production of knowledge irrespective of level and allow the institutional pool of expertise to curate educational materials which the peers may review to facilitate high-quality learning. It would also entail active learning of the faculty members, contribute to professional advancement, widen participation, and enhance content knowledge by providing first-hand exposure at building and integrating education resources.

4. ***Self-paced and lifelong learning:*** OERs facilitate self-paced learning that provides the learners time and space flexibility. The learners are free to choose a convenient time and decide the content they would like to cover without any fear of losing out on instruction as in traditional classroom settings. In turn, this makes learning a truly enjoyable experience that is mostly self-initiated by the learner. In the case of individuals working on a full-time basis, the OERs allow them to continue their learning without any hindrance. Thus, OERs have the potential to support lifelong learning.

5. ***Promotes learning at all levels:*** OERs bridge the gaps among formal, informal, and non-formal education by bringing together a diverse base of learners and promoting informal learning at all levels. Unlike time-stipulated traditional classrooms where learning is institutionalised, learners can conveniently sit comfortably at home and study from the OERs. Not only is the learning self-initiated, but it also promotes incidental learning. After studying the contents of an OER in their area of interest, the learners may often feel curious and start exploring related concepts, which deepens their learning.

CHALLENGES OF OERs

1. ***Accessibility constraints:*** Although OERs primarily seek to make high-quality learning resources openly available to all, their availability for differently-abled users is an important area of concern as very limited OERs can support the learning of special needs children. Also, since many resources are in the digital format and hosted on various internet platforms, the learners located in remote locations may be unable to access such resources; thus, widening the digital divide.

2. ***Selection of appropriate and relevant content:*** With the explosion of ICTs, OERs reign over the internet, it has become an uphill task to find the most suitable textbook or resources that align with the curriculum. This, in turn, makes the search for appropriate and relevant content a time-consuming task with knowledge of certain technical skills to sift through the search results.

3. ***Increased burden on editorial production:*** The paradigm shift to OERs has necessitated the production of high-quality educational content and resources to facilitate quality learning. Suddenly, there is an increased dependence on the editorial production process, which leads to more work for authors, content creators, etc., and may lead to a lack of consistency in the quality of OERs.

4. ***Regular updating:*** OERs tend to lose relevance if not updated from time to time. Regular updates ensure that the content is up to date with the contextual changes and incorporates the recent developments. In contrast, the content that has not been updated for long tends to decline in value as recent developments take over existing content and may challenge the existing content. Although regular updating of OERs requires dedicated support, it ensures content accuracy and quality.

5. ***Decline in revenue:*** Since the OERs are openly available, the authors can no longer draw royalties based on developed content. This has led to a decline in revenue for the authors and content creators.

POPULAR OER INITIATIVES

Global initiatives: The global initiatives that have been taken across the world to support the OER movement are –

1. Khan Academy https://www.khanacademy.org/
2. OER COMMONS https://www.oercommons.org/
3. OpenStax CNX https://cnx.org/
4. Open Textbook Library https://open.umn.edu/opentextbooks/
5. Curriki https://www.curriki.org/
6. Wikimedia Commons https://commons.wikimedia.org/wiki/Main_Page
7. CK-12 https://www.ck12.org/student/
8. Open Course Library http://opencourselibrary
9. Indian initiatives: The initiatives undertaken by the GoI to support public access to educational resources are –
10. National Programme on Technology Enhanced Learning https://nptel.ac.in/

11. Indira Gandhi National Open University http://ignou.ac.in/ignou/studentzone
12. National Repository for Open Educational Resources https://nroer.gov.in/welcome
13. National Institute of Open Schooling https://www.nios.ac.in/
14. Karnataka Open Educational Resources http://karnatakaeducation.org.in/KOER/en/index.php/Main_Page
15. Pratham Foundation http://blog.prathambooks.org/p/cc-tracker.html
16. National Mission on Education through ICT http://www.nmeict.ac.in/Document/OER_Policy.pdf

4.9.3 Massive Open Online Courses (MOOCs)

With the massive changes brought in by the digital revolution, especially in the field of teaching-learning, MOOCS are often seen as great opportunities to learn more about one's particular field of interest or liking. Rampant advancement in technology has resulted in the growth of registered users of MOOCs in recent years. MOOCs offers hundreds of courses around the world in various diverse fields ranging from technology, management, medicine, psychology, health care etc. MOOCs are of recent developments, and their history is not that old. Based on the 'connectivist' distributed peer learning model, Stephen Downes and George Siemens coined the phrase in 2008. Following that, in 2011, a few more educational videos developed by professors from Stanford University disseminated through open online platforms with free web resources. This was the year that MOOCs exploded all over the world, and the number continues to rise every day.

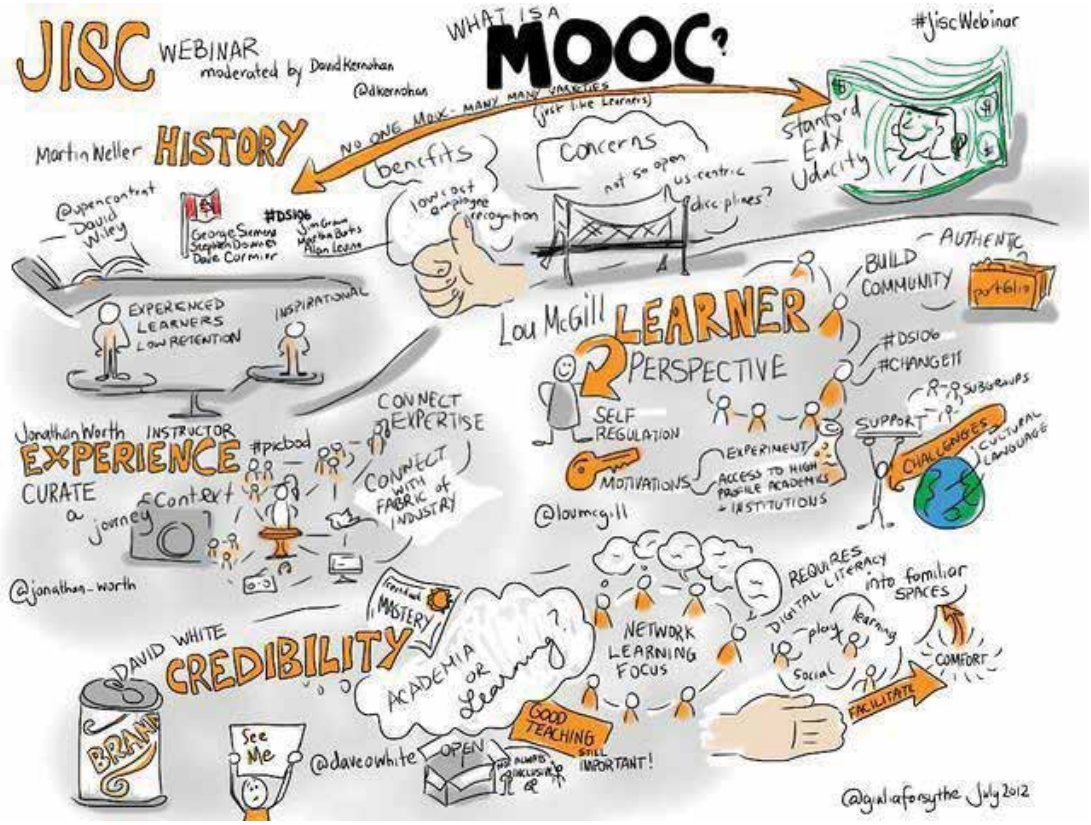


Fig.8 What Is A MOOC? by giulia.forsythe is licensed under CC BY-SA 2.0

MOOCs are courses delivered online and accessible to all for free. MOOC stands for the massive open online course:

- Massive because unlimited users can enrol themselves, and the number of registered users can run in hundreds or thousands.
- Open because the enrolment is open to all, without any formal admission procedure required.
- Online because they are transmitted via the internet.
- Course because they aim at teaching a specific subject based on particular content.
- The MOOCs typically consist of pre-recorded video lessons, readings, assessments, and discussion forums disseminated to the enrolled users through the net.

THREE MAIN CHARACTERISTICS OF A MOOC:

1. ***Open Participation: As stated earlier,*** MOOCs are free and open to anyone who has access to the Internet. It depends on the liking of the individual if one wishes to pursue one or more than one course at a time. All the content which is made part of the course is open to all the people enrolling for the course. The work both by the facilitator and the learner is shared publicly and is open to all. Finally, there is openness in terms of the learner's role on what role one decides to play and to what extent.

2. ***Participatory:*** Voluntary participation and the degree to which an individual participates is quite flexible when it comes to MOOCs. Of course, the learning in a MOOC is maximised by participating in the creation and sharing of feedback, ideas, and suggestions.

3. ***Distributed:*** The most basic element of a MOOC is its connectivity feature. Any information or knowledge that is generated in a MOOC should be spread across a network of users enrolling for a particular course. The vast majority of learning occurs within social learning environments, in which the registered users interact with the material (and each others' interpretations of it). The course readings and the relevant documents should be arranged at the beginning of the session to form the base for discussions and further readings.

LEARNERS PROFILE

The majority of the students enrolling for MOOCs register themselves based on their professional likings and a larger objective in mind but mainly the hobby learners form the largest group. There are various reasons as to why a user may register himself/herself for any MOOCs; it could entail getting educational knowledge of a particular field to having certificates that will help them apply for a job. Although taking courses on MOOCs is free of cost, to get a certificate and taking the exam for the same requires paying some amount of fee depending on the course one might choose.

MOOCS PEDAGOGY

To successfully run a MOOC, minimum academic support is more than enough. The pedagogies required in the field of MOOCs have been readily available in distance education for many years now. They are now designed accordingly to meet the expectations of thousands of users registering for MOOCs and who wish to take or learn a course for free. The courses on MOOCs are mainly based

on a weekly structure where students can access relevant sources according to their convenience. Activities include automated multiple-choice quizzes, short videos, document sharing and forums. The courses are designed on the peer-learning model with an expert continuously monitoring and running the course. There are synchronous learning opportunities (e.g., live seminars) besides asynchronous learning events.

Here are some main platforms offering great MOOCs globally:

- Coursera
- edX
- Udacity
- Udemy
- FutureLearn

Here are YouTube Video tutorial links on how to register for various MOOCs for three major MOOC platforms

- Coursera https://www.youtube.com/watch?v=bOs4KXZtFDs
- edX https://www.youtube.com/watch?v=sEeYnsobXIc
- Udemy https://www.youtube.com/watch?v=XlW7GjyKnSU

SWAYAM platform (Study Webs of Active Learning for Young Aspiring Minds) is an initiative by the Government of India to facilitate learning through MOOCs. The programme is designed to achieve the three cardinal principles of education policy: access, equity, and quality. The platform seeks to provide good quality, interactive teaching-learning resources to all, especially the most disadvantaged sections of society. The courses are prepared by some of the most eminent teachers of the country and can be accessed by everyone free of cost. More than 1,000 carefully appointed resource persons and teachers from all over the country take part in preparing these specially designed courses. A list of some popular SWAYAM courses specifically designed for teacher education programs can be accessed here: https://swayam.gov.in/explorer.

NCERT (National Council of Educational Research and Training) has been developing course modules for MOOCs for the school education system in 12 subject areas (Accountancy, business studies, biology, chemistry, economics, history, geography, mathematics, physics, political science, psychology, and sociology) for classes IX-XII. Twelve (12) courses were launched in the first cycle. Nearly 22,000 students were registered on various courses. Twenty (20) courses were launched in the second cycle.

In recent years, massive open online courses (MOOCs) have become one of the most popular and rapidly rising trends in higher education. With globally open and free access, video-based educational content, problem sets, and forums, MOOCs are increasingly becoming one of the most popular choices among the users of the internet and technology. MOOCs have successfully brought together the geographically disaggregated learners across the globe owing to its time and place flexibility.

4.10 Refresher Courses for Teachers (Swayam-Moocs)

According to Collins Dictionary, "A refresher course is a training course in which people improve their knowledge or skills and learn about new developments that are related to the job that they do."

The refresher courses provide opportunities for in-service teachers to exchange experiences with their peers and mutually learn from each other. It provides a forum to familiarise with the latest advances in the subjects, technological spin-off etc.

SWAYAM

SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) is the MOOC platform which designed, developed, and run by the Government of India to achieve the three cardinal principles of education policy viz., access equity, and quality. The objective of starting SWAYAM is to provide good quality teaching-learning resources and make them accessible to all, especially and including the most disadvantaged sections of society. SWAYAM being a digital platform that particularly aims to reach the masses, seeks to narrow the digital gap for students who have hitherto remained inaccessible or have been untouched by the digital revolution and, consequently, not be able to join the mainstream knowledge sector.

This aim of bridging the digital divide is accomplished through a platform that hosts all the courses taught from Class 9 through post-graduation and can be accessed by anybody, anywhere, at any time. The courses are quite interactive, designed by some of the most eminent teachers of the country, and can be accessed by all without any fee required. More than 1,000 carefully appointed resource persons and teachers from all over the country take part in preparing these specially designed courses.

The courses hosted on SWAYAM are in 4 quadrants –

1. video lecture
2. specially prepared reading material that can be downloaded/printed
3. self-assessment tests through tests and quizzes and
4. an online discussion forum for clearing doubts.

To enrich the teaching-learning experience of all those involved, steps have been taken to carefully pick the content and present it in the form of audio-video and multimedia and state of the art pedagogy/ technology.

To ensure that only the best quality content is produced and delivered, nine National Coordinators have been appointed. They are:

1. AICTE (All India Council for Technical Education) for self-paced and international courses
2. NPTEL (National Programme on Technology Enhanced Learning) for Engineering
3. UGC (University Grants Commission) for non-technical post-graduation education
4. CEC (Consortium for Educational Communication) for under-graduate education
5. NCERT (National Council of Educational Research and Training) for school education
6. NIOS (National Institute of Open Schooling) for school education

7. IGNOU (Indira Gandhi National Open University) for out-of-school students
8. IIBM (Indian Institute of Management, Bangalore) for management studies
9. NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme

All the courses offered on SWAYAM are made available to all free of cost. However, any learner who seeks a SWAYAM certificate has to register for the final proctored exams, which are usually chargeable for a fixed fee and visit in-person at designated centres on specified dates. Universities/colleges approving credit transfers for these courses can use the marks/certificate obtained in these courses for the same. A list of some popular SWAYAM courses specifically designed for teacher education programs can be accessed here: https://swayam.gov.in/explorer.

List of some popular courses on teaching and teacher education available nationally and globally on various popular MOOCs platforms is as below:

- Coursera: https://www.coursera.org/search?query=teacher%20education&
- edX: https://www.edx.org/learn/education
- Udemy: https://www.udemy.com/courses/teaching-and-academics
- Future Learn: https://www.futurelearn.com/subjects/teaching-courses

STEPS TO REGISTER FOR MOOCS

Generally, one can register for various MOOCs courses in easy to follow steps. One needs to register themselves through a valid e-mail id and sign up for these courses on their websites.

After registration, one can browse through the categories column to select their area of interest in which one wants to pursue the course. Depending on the requirements, one can easily register themselves and start learning. Many MOOCs may require one to pay a fixed amount of fee if one wishes to get certified.

Know Your Progress

Let us see if you can answer the following questions:

1. What are Virtual Communities? What are the educational implications of virtual communities?
2. What are blogs? How would you create a blog for online teaching-learning? Discuss the benefits and barriers of using blogs for teaching-learning.
3. How can you use social media platforms for teaching and learning? Choose any platform and discuss how you would use it for engaging students along with the barriers that may impede its use.
4. With the help of a plan, explain how you would use any discussion forum of your choice for teaching-learning.
5. What are the ethical considerations that should be kept in mind during online teaching-learning?
6. Briefly discuss the various initiatives taken by the GoI to facilitate and support e-learning.
7. Discuss in brief LMS, OERs, and MOOCs.
8. Identify and list some refreshers courses for teacher education programs with a special focus on SWAYAM.

Things to Rembers

The advent of technologies has facilitated a paradigm shift in educational practice, with online learning emerging as one of the most promising means for continuous learning. In view of this, several platforms have evolved to facilitate independent, cost-effective, and collaborative online learning. Amongst others, virtual communities as one of means for online teaching-learning, have transcended the boundaries of traditional classrooms and made learning more accessible, interactive, and collaborative; thus, giving knowledge acquisition and construction a new dimension. The learners and teachers interact a/synchronously through various modalities to share knowledge, opinions, thoughts, and ideas to generate meanings. Learning within such communities may be unorganised due to uncertainty of instructors' presence, although it is self-paced, self-directed, immersive, and practical. Within the ambit of virtual communities, blogs, social networking sites, and discussion forums entail seamless learning for the users by outreaching to diverse learner base that provides for multiliteracies, 24/7 accessibility, reduced cost of learning, access to resources in different formats, increased interactivity and engagement, and high-quality content.

On the other hand, the technological affordances are accompanied by challenges such as lack of infrastructure, digital literacy, motivation, netiquettes; instructor unavailability; cyberbullying; phishing attacks; malicious software, etc. These challenges often widen the digital divide and at times leads to digression from the main topic. In light of the benefits of various online learning platforms and the accompanying challenges thereto, it has become quintessential to regulate the performance and behaviour of individuals within the technology-mediated environment through implicit and explicit codes of ethics to ensure effective online learning. The codes of ethics aid in ensuring the technology users uphold group values, show respect, acceptance, and tolerance towards others' views, follow the group norms, and remain culturally sensitive while conducting themselves over the virtual platforms.

Furthermore, the delivery of content in online mode is primarily facilitated through learning management systems (LMS), open educational resources (OERs), and massive online open courses (MOOCs) that serve as a storehouse of content. These modalities offer a wide range of benefits to support continuous, high-quality learning at learners' convenience. Still, they often grapple with infrastructural investment in terms of devices, lack of digital literacy, erratic power supply, unavailability of stable internet connectivity, etc. Except for OERs, the contents of LMS and MOOCs may be copyrighted or governed by licenses, resulting in limited reuse, adaptation, remixing, and distribution, which eventually limits accessibility. In light of this, various initiatives have been launched by the governmental and international agencies to support the teaching-learning process which would help teachers keep themselves abreast with the latest developments and use the modalities legitimately. Also, it would enable the teachers to upskill their professional knowledge through various refresher courses and, at the same time, customise their teaching style to suit the learning context in which they function and cater to a diverse learner base.

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UNIT I

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