PEDAGOGY OF BIOLOGICAL SICENCE PART – 2

(PONDICHERRY UNIVERSITY)

STUDY MATERIAL

UNIT -7

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Unit - 7

ICT RESOURCES IN LEARNING BIO-SCIENCE

Syllabus : Dale's Cone of Experience (modified) – Teaching Bio–science with: audio broadcast, educational television, multimedia: audio, slideshow, animated video, simulation, games, and e–picture/poster. – Blended learning: eBooks, web, wikis, Moodle, social networking. – ICT tool used in classroom – advantages of using ICT in learning–teaching processes.

Introduction

Information and Communication Technology (ICT) has changed the way people interact and communicate with one another. The school system cannot remain aloof from this development. Gradually ICT has entered into schools and has started influencing teacher-learner interaction. The teacher of twenty-first century must be proficient enough in using ICT for her teaching-learning in the classroom. In today's world, modern technology offers very exciting possibilities for this purpose. In this chapter we shall discuss on various forms of print and ICT resources.

Dale's cone of experience

Edger Dale's cone of experience is a model that includes several theories related to teaching-learning design and processes. During the 1960s, Edgar Dale theorised that learners retain more information by what they 'do' as opposed to what is 'heard', 'read' or 'observed'. His research led to the development of the 'Cone of Experience'. Today, this 'learning by doing' has become known as 'action learning.' Modified diagram of this cone is depicted in Fig. 10.1 This diagram is self-explanatory.

Using the Cone of Experience

The least effective method at the top involves learning from information presented through verbal symbols, i.e. listening to spoken words or audio aids. The most effective strategies at the bottom involve direct, purposeful learning experiences, such as hands-on or field experience. A direct purposeful experience represents reality or everyday life.

The Cone indicates the average learning for various strategies of teaching-learning. As we progress down the Cone, the greater the learning and deeper the understanding. It also

suggests that involving learners in the process of selecting a teaching-learning resource is important. It facilitates to strengthen their knowledge.

Dales' Cone of Experience is a tool to help teachers make decisions about teaching-learning resources and activities. The teachers can think on the line of following questions for making a decision.

• Where will this teaching-learning resource fit with the learner's experience on the Cone?

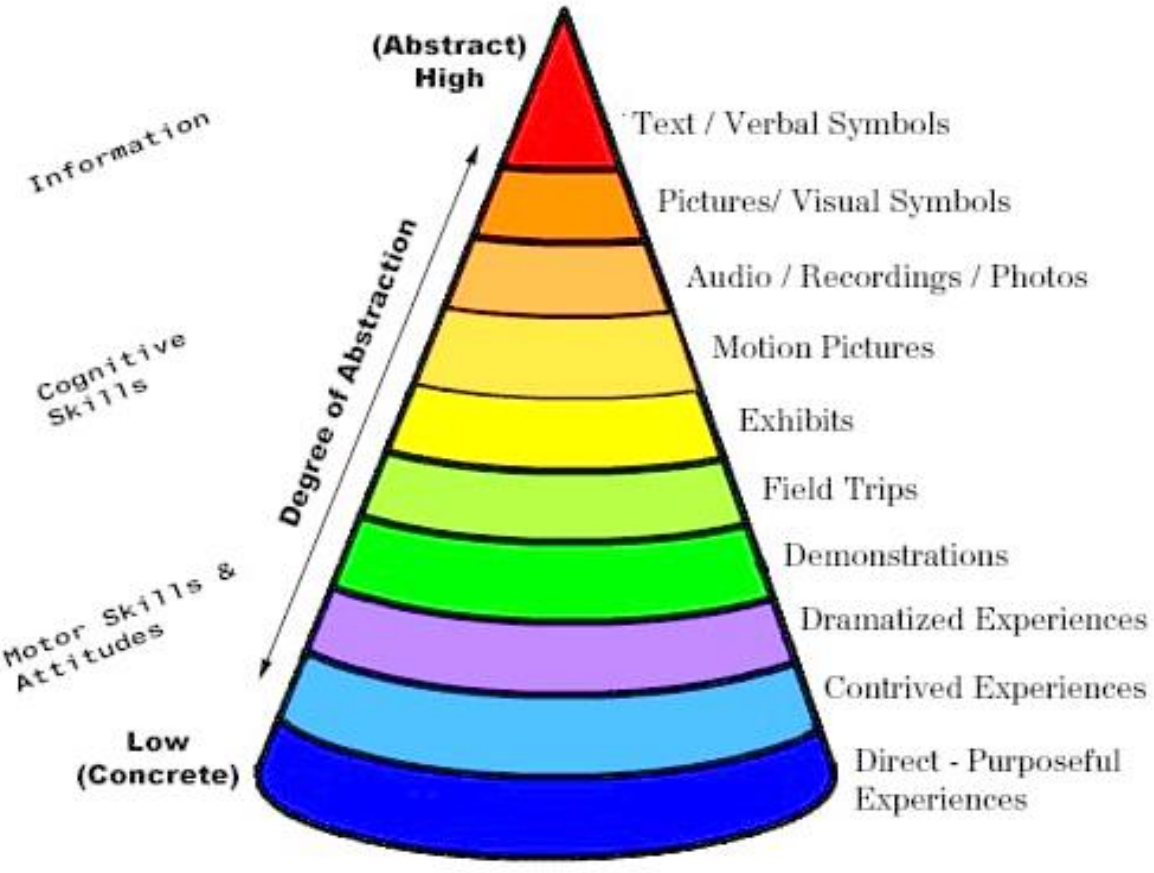
• How far it is related to their real life?

• What kind of learning experiences can be provided in the classroom?

• How does this teaching-learning resource augment the information supplied by the textbook?

• What and how many senses can learners use to learn this teaching-learning material?

• Does the teaching-learning material enhance learning?



Edger Dale's Cone of Experience (modified)

All the experiences that human beings derive are mainly from three sources namely

i) Direct sensory contact which involves "doing"

ii) Pictures or some other forms of representation of objects which involve " Observing"

and

iii) Oral or printed words which involve "symbolizing"

Of these three possibilities, the third is perhaps of least value from the point of view of teaching the young learner. All the learning experiences which can be utilized for classroom teaching are shown by Edger Dale in a pictorial device – pinnacle from which he called the 'cone of experience'.

The base of cone represents the concrete, direct, first hand experiences. In the absence of direct experiences teachers use models and mock ups. Such teaching aids provide contrived experiences. A contrived experience is a simplified experience through a model. For example, it will be a difficult thing to bring in an electronic microscope or an atomic reactor in the classroom. But a working model of them will provide contrived experience.

The next stage is the dramatized experiences which provide a situation for participation in a reconstructed situation, though it is not a real experience. Dramatization can also be used in the classroom.

Demonstrations, field studies, exhibits etc. are helpful in visual explanation of the phenomena. If students are involved in these activities, they can get a feel of creative participation.

The highest abstraction is through symbolic or verbal experience. A biology teacher uses chalkboard, charts and maps to give abstract, situations and students are far away from the real things. Verbal communication gives simple representation of a thing and fails to evoke participation.

1. Teaching Bio-Science with Audio

(a) Broadcast talks

Radio broadcast and audio recordings are the sources of audio learning experiences for the children. In order to provide learning experience beyond the school syllabus and to relate it to

the real life outside the classroom, school broadcast programmes could be one of the best medium. It may not always be possible for a science teacher to invite eminent persons of science for the lecture or talk. In such cases the lectures or speeches can be pre-recorded and can be played in the classrooms. There are various types of programmes, such as discussion forums, question-answers, debates, quizzes, speeches, dramas, which can be either played live or can be pre-recorded, to be used in teaching-learning of science.

The All India Radio has regular programmes for school children. Programmes generally include talks on educational, scientific, current topics, etc. The topic, date and time of broadcast of such talks are given in advance. The schools can take advantage of such talks. Sometimes, it is also possible to synchronise the broadcast on a topic with the actual teaching-learning time of that topic in the class. To get the maximum benefit from such talks, the following points should be kept in mind:

- ❖ To keep students' interest alive, they are facilitated to get familiar with the background of the talk beforehand. A discussion could be arranged after the talk.
- ❖ Preferably short duration talks are arranged.
- ❖ The students having hearing problems are seated near the source.

(b) Audio tapes

The major advantage of a magnetic audio tape over a disc is that one can record programmes easily and economically. When the material becomes outdated, or is no longer useful, it could be erased and the tape can be reused. Tapes are not as easily damaged as discs, and they can be easily stored. Records of talks on interesting topics by eminent scholars can be easily reproduced in the classroom. These talks provide an inspiration to the students. Such a recording could be used to introduce a topic or to develop it. These devices are seldom used these days.

Advantages

- Audio media are inexpensive. Once the audio tapes and equipments have been purchased, there is no additional cost, because the tapes can be reused.
- Audio materials are readily available and very simple to use. They can be used for a group or an individual.

- Audio cassette recorders are portable and can be used outside the classroom because they can be run on battery.
- Cassette recorders are ideal for home study as students can afford to have their own cassette players. Audio tapes can be easily duplicated in required quantities.
- They can be used in all phases of teaching-learning from introduction of a topic to assessing students' learning. The audio media could be very well used for the purpose of self-paced learning. If required, learner can go back and repeat desired segments of teaching learning as often as necessary because the recorder/playback machine can serve as a very patient tutor. On the other hand, learners can skip ahead or increase the pace of their learning as and when desired.
- Pre-recorded audio media can be used as 'talking books' for the visually impaired students. Audio tapes can easily be prepared by teachers for students with special educational needs.

2.) Educational television

The television in the present day society can be used as one of the important teaching-learning aids. It combines the advantages of a radio (broadcast) and of a film, and could be used for mass education. Topics of discussion can be announced in advance and teacher can easily carry on teaching-learning process around the telecast time to incorporate them in the on-going lesson so that students can watch and discuss the concepts in the class. Such teaching-learning helps students to develop their interest in the subject. UGC programmes are telecast on Doordarshan. NCERT telecasts its educational programme on Gyan Darshan channel.

There is a tremendous potential to increase television based education as we have a dedicated satellite in the geostationary orbit named EDUSAT. A large number of educational television programmes can be made and telecast. EDUSAT also offers a facility for two-way interaction where the viewers can raise their doubts and make comments also.

NCERT also uses video-conferencing mode to interact and train teachers all over India. A large number of scientific programmes on scientific issues are telecast on various channels of television. Teacher herself needs to be aware of such programmes to guide her students. National Geographic, Discovery, Discovery Science are informative channels made available through television. These channels enable us to see many programmes on scientific issues with High

Definition (HD) transmission and give a better, more vivid watching experiences which are of educational value.

Multimedia

The Multimedia concept involves using multiple media for transaction of a concept. It involves integrating different media into a structured and systematic presentation. Each medium in a multimedia system is designed to complement the other, so that ideally the whole multimedia system becomes greater than the sum of its parts. Multimedia systems are multi-sensory and stimulate learning. The multimedia kit may include films, videos and audio tapes, records, still pictures, overhead transparencies, maps, worksheets, charts, graphs, booklets, real objects and models.

Commercially multimedia kits are available for various subjects. Multimedia kits can even be prepared by teachers. It is important that the components of the kit be integrated, that is, each component contributes to the attainment of the lesson objective. Multimedia activities should also be correlated with other relevant learning activities in the classroom. Multimedia kits should be designed to transact particular topics and develop various skills. The teachers should involve students in handling and manipulating the materials in order to maximise their learning potential. Since they cater to many senses, multimedia kits make learning enjoyable. They are versatile in their content, range of media, and variety of applications, and thus contribute to learning for a wide variety of learners in many subject areas. In addition, multimedia kits provide scope for individualised attention to students.

Multimedia is content that uses a combination of different content forms such as text, audio, images, animations, video and interactive content. Multimedia contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or hand produced material. Multimedia can be recorded and played, displayed, interacted with or accessed by information content processing devices, such as computerized and electronic devices, but can also be part of a live performance. Multimedia devices are electronic media devices used to store and experience multimedia content. Multimedia is distinguished from mixed media in fine art; by including audio, for example, it has a broader scope. The term "rich media" is synonymous for multimedia. Hypermedia scales up the amount of media content in multimedia application.

i) Audio

An audio tape recorder, tape deck or tape machine is an analog audio storage device that records and plays back sounds, including articulated voices, usually using magnetic tape, either wound on a reel or in a cassette, for storage. In its present-day form, it records a fluctuating signal by moving the tape across a tape head that polarizes the magnetic in the tape in proportion to the audio signal. Tape-recording devices include reel-to-reel tape deck and the cassette deck.

Talk radio is a radio format containing discussion about topical issues. Most shows are regularly hosted by a single individual, and often feature interviews with a number of different guests. A talk show or chat show is a television programming or radio programming genre in which one person discusses various topics put forth by a talk show host.

ii) Slideshow

A slideshow is a presentation of a series of still images on a projection screen or Electronic display device, typically in a pre-arranged sequence. A well-designed slide show serves as a visual aid and helps keep an audience's attention.

- The slide show is a great way to breakdown information in simple ways. Teacher can use the slideshow to make their point in seminars and workshops.
- It’s a great tool to keep all the information in one place
- All points of a topic can be neatly organized in a single place, using different slides, and Keeping track of information is easy.
- During school has an exhibition or an events day, graduation or a parent-teacher meet, The slideshow is an excellent way to give out capsules of information
- This is an environmentally safe way to carry education from one generation to the next. Making digital slides with maximum impact are Microsoft PowerPoint, Prezi, Google Slides, Xtensio, Keynote and Place it

iii) Animated videos

Animations produced for the specific purpose of fostering learning. The popularity of using animations to help learners understand and remember information has greatly increased since the advent of powerful graphics-oriented computers. This technology allows animations to be produced much more easily and cheaply than in former years. Previously, traditional

animation required specialised labour-intensive techniques that were both time-consuming and expensive. In contrast, software is now available that makes it possible for individual educators to author their own animations without the need for specialist expertise. Teachers are no longer limited to relying on static graphics but can readily convert them into educational animations.

Uses of animated videos

- Emphasizes development of students' skills and understanding of creating and responding.
- Enables students to apply Imagination & Rational Thinking.
- Enables students to invent and explore multiple solutions to a problem.
- Enables students to understand the value of reflection and critical judgment in creative work.
- Facilitates positive peer interaction, including receiving and using feedback.
- Encourages self-motivation to create and problem solve.
- Uses artistic literacy as a natural enhancement to learning in other content areas.
- Fosters positive attitudes toward Art & Animation.
- Introduces career possibilities.

iv) Simulation

A simulation is a simplified version of reality in which essential physical or social elements are represented without hazards, cost or time constraint normally associated with them. The purpose of simulations is to enable us to understand and function in real situation. Simulations are representation of real situations with the element of safety, because some real equipment cannot be used in the class as they may be too costly or too delicate or may be length of time involved in a real exercise would be too great. Simulation and games can give students practice in decision-making and allow them to test a hypothesis in abstract situations.

One familiar example is the prediction of effect of increase in temperature on the pressure of a system. The variables can be manipulated on computers and it is possible for students to test out various hypotheses. One of the marked advantages of effective simulation is increase in students' motivation and participation. Students respond with unusual enthusiasm and interest to simulation/ gaming, because of its relevance to how things get done in real life.

v) Games

Games are a ubiquitous part of life in our culture, and experts suggest they will become even more deeply embedded in the coming years. Games help people develop a disposition toward collaboration, problem-solving, communication, experimentation, and exploration of identities, all attributes that promote success in a rapidly-changing, information-based culture.

vi) E- Poster

An electronic poster (E-Poster) is a poster in PowerPoint format, allowing the inclusion of movies, and other multi-media formats, and presenters are encouraged to take advantage of the versatility of this medium. All multi-media E-Posters will be presented at numbered monitors in the Exhibition Hall. The time allotted for E-poster presentations is 60 minutes, and authors are requested to be at their assigned computers for the period of time specified in the acceptance message. During this time you will be available for discussion of your E-Poster. A formal presentation is not necessary.

Uses

- Preparation of the poster by using a pre-defined model and the preferred edition software
- Enhanced presentations with the possibility of including videos online submission in an easy, quick and secure way.
- No need for printing, carrying and posting the poster on conventional boards More attractive, interesting and interactive presentations
- Higher work visibility, thanks to the searching options that make it easily accessible

Blended learning

Blended learning is a formal education program that involves combining Internet and digital media with traditional classroom methods that require the physical presence of both a teacher and students, with some element of student control over time, place, path, or pace.

Blended learning is a term increasingly used to describe the way e-learning is being combined with traditional classroom methods and independent study to create a new, hybrid teaching methodology.

It represents a much greater change in basic technique than simply adding computers to classrooms; it represents, in many cases, a fundamental change in the way teachers and students approach the learning experience.

Blended learning is a combination of offline (face-to-face, traditional learning) and online learning in a way that the one compliments the other. It provides individuals with the opportunity to enjoy the best of both worlds. For example, a student might attend classes in a real world classroom setting, and then supplement the lesson plan by completing online multimedia coursework. As such, the student would only have to physically attend class once a week and would be free to go at their own pace

E-learning

E-learning is electronic learning, and typically this means using a computer to deliver part, or all of a course whether it's in a school, part of your mandatory business training or a full distance learning course. In the early days it received a bad press, as many people thought bringing computers into the classroom would remove that human element that some learners need, but as time has progressed technology has developed, and now we embrace smart phones and tablets in the classroom and office, as well as using a wealth of interactive designs that makes distance learning not only engaging for the users, but valuable as a lesson delivery medium. Building partnerships with quality training providers, and combining this with a dedicated experienced technical team and support staff, Virtual College provides the perfect blended learning environment,

a) E - Book

An **electronic book**, also known as an **e-book** or **eBook**, is a book publication made available in digital form, consisting of text, images, or both, readable on the flat-panel display of computers or other electronic devices. Although sometimes defined as "an electronic version of a printed book", some e-books exist without a printed equivalent. E-books can be read on dedicated e- reader devices, but also on any computer device that features a controllable viewing screen, including desktop computers, laptops, tablets and smart phones.

Applications of e-books

- **Informational Texts:** There is a much greater emphasis on students reading nonfiction content than ever before. E-books give teachers access to a large volume and wide array of titles to match what they need.
- **Student Choice:** E-book series offer flexibility in the classroom. For example, in the Britannica Guides Series, there are 10 different titles, all set up in the same structure. Teachers can use the series to teach text features, vocabulary, and research skills; while each student can read the title that they find the most interesting.
- **Search by MARC Records**: E-books provide free linked MARC records, enabling search, discovery, and access to collections from your library catalog. E-books also make citing easy, providing APA and MLA citations.
- **In-class Teaching Tools:** E-books are great to explore with the whole class. Teachers and students can insert questions and notes, highlight key sections, bookmark passages, and save it all for review. In addition, e-books are easy to share across platforms like Pinterest, Facebook, Twitter, LinkedIn, and email.
- **Partner Subscriptions:** Thousands of Britannica's nonfiction e-books for every age, reading level, and subject can also be used on any one of a number of popular platforms, including: EBSCO, Follett, GALE, MACKIN, OverDrive, and ProQuest.
- **Funding Resources:** Britannica Digital learning and DonorsChoose.org have partnered to connect educators with a thriving community of donors that are eager to fund all of your e-book needs.
- **Student-Tailored Options:** Teachers can select e-books by GRL, Lexile level, and grade level to find books on the same subject at multiple reading levels. In addition, visually impaired readers can change the font size for more ease while reading.
- **They're Great for Everyone:** E-books are environmentally friendly, they are more affordable than paper-based books, and they take some of the weight off… literally! Books are so heavy!

b) Web

It is a major tool for gathering, accessing, analysing, sharing and disseminating information. With the help of networking your computer is connected with remote computers for

accessing the information. This web of computers has certain specific locations called websites which store information on specified subjects. This information can be accessed by any internet user through the website's address. Alternately, one can also upload one's own information on the web to make it available to any user. The user depending on her/his requirement then navigates through the web to access desired information.

So versatile is the computer with internet that it is now an essential part for all stages of education, from the lowest to the highest, and from sciences to social sciences, fine arts, languages and whatever else one can think of. It is an excellent resource for teaching-learning. Newer applications of computer are being discovered everyday in the field of education.

The teachers can use computer and the internet to design their lessons using huge reservoir of information and knowledge available online. The information includes film/video/audio clips, animations, drawings of complicated pieces of apparatus and a host of data of all kinds. One of the advantages of using computer and the internet is that one can explore quickly the information available online and use it judiciously to make lessons more relevant and interesting. In addition to designing lessons and teaching strategies, teachers can write their reports, prepare question papers for assessment and evaluation of students. Electronic portfolio of all students of a class can also be maintained on the computer.

The teachers can form networking groups where they can exchange ideas, innovative experiences, joys and excitements of teaching-learning processes with their peers. They can get help from them and give help to them. They can use computers and internet as a tool for lifelong learning to enhance their professional and social stature.

The teachers can also direct their students to educational sites already reviewed by them, so that students can improve on their understanding of various concepts of science by themselves and encourage them to become independent learners. It would take off some tasks from the teachers, giving them much needed time for their other duties. In addition, teachers can set various tasks to students, such as writing reports, term papers, etc., which students can do using the computer.

Wikis

A wiki can be thought of as a combination of a website and a word document. At its simplest, it can be read just like any other website, but its real power lies in the fact that groups can collaboratively (and privately, when necessary) work on the content of the site using just a standard web browser.

The second important element of a wiki is its ability to keep track of the history of a document as it is revised. Since people come to one place to edit, the need to keep track of word files is eliminated. Each time a person makes changes to a wiki page, that revision of the content becomes the current version, and an older version is stored. Versions of the document can be compared side-by-side, and edits can be 'rolled back' if necessary.

A wiki makes it easy for students to write, revise and submit a assignment, since students can develop, write and revise. Students can be given a wiki page to develop an assignment, and might start by tracking their background research. This allows the teacher, and peers, to see what they're using, help them if they are off the track, suggest other resources, or even get ideas based on what others find useful.

Next, the student can draft the paper in the wiki, taking advantage of the wiki's automatic revision history that saves a version of the document each time she makes changes. This allows the teacher and peers to see the evolution of the paper over time, and continually comment on it, rather than offering comments only on the final draft. It helps in making assessment continuous. When the student completes the final draft, the teacher and peers can read it on the wiki, and offer feedback. You may visit the website www.wikispaces.com to get an idea about it.

Moodle

Moodle is a free and open-source learning management system (LMS) written in PHP and distributed under the GNU General Public License. Developed on pedagogical principles, Moodle is used for blended learning, distance education, flipped classroom and other e-learning projects in schools, universities, workplaces and other sectors. With customizable management features, it is used to create private websites with online courses for educators and trainers to achieve learning goals. Moodle allows for extending and tailoring learning environments using community-sourced plugins.

Moodle was originally developed by Martin Dougiamas to help educators create online courses with a focus on interaction and collaborative construction of content, and it is in continual evolution. The first version of Moodle was released on 20 August 2002. Nowadays the Moodle Project is led and coordinated by Moodle HQ, an Australian company of 50 developers which is financially supported by a network of eighty-four Moodle Partner service companies worldwide. Moodle's development has also been assisted by the work of open-source programmers.

Moodle is a learning platform used to augment and move existing learning environments online. As an E-learning tool, Moodle developed a number of features now considered standard for learning management systems, including a calendar and a Gradebook. Moodle is a leading virtual learning environment and can be used in many types of environments such as education, training and development and in business settings.

Social networking

A social networking site can be a good way to make connections with people having similar interests and goals. These sites can be a way to connect with or 'meet' people that a student may not get otherwise. One can stay connected to the learning communities as a whole through these sites. These websites offer tremendous educational potential for students and teacher-educators for advanced teaching learning process. Teacher can share link of educational website with her students. Some of the social websites are discussed below. It is to be noted that these websites are not prescriptive.

i) Face book (www.facebook.com)

One of the most popular social networking sites is face book. One can adjust privacy settings and make group so as to control who has access to one's personal information. Students' social networking accounts can help teacher to discuss on the doubts and questions on any concept. She can also know about their interests and hobbies and this may help her for better understanding of her students.

ii) Twitter (www.twitter.com)

There is a value in networking and real time interaction that we can get using twitter. Many educators and academicians find this to be an effective strategy for dealing with the

isolation that can come from working in the classroom or office. Imagine encountering technical difficulties during our lesson and having a means of receiving assistance within minutes. Twitter is an effective communication tool for concise messages and news items, or links to longer messages and news items.

Twitter is fun to use and may, therefore, be effective in engaging students in discussions who do not need to write longer essays. Consider the ability to receive assistance from others during a teaching-learning situation where we don't know the answer to a student's query. We can share events at work and this helps us to know our friends a bit more and adds an additional layer of community within our online network. One can customise and use it to meet ones' specific needs and interests.

iii) Orkut (www.orkut.com)

Orkut communities can be used productively by teachers for effective teaching-learning. One can get enormous benefits through Orkut, provided that we use it in a productive way. Discussion or scientific issues can be generated and idea can be exchanged on this site. Through Orkut communities, like-minded people can come together for better understanding of their subjects of interest.

We can create communities on Orkut in the name of our school to share our memories and stay in touch with our childhood friends. Orkut can be used to get news updates, find a suitable job, get good career ideas, and know about institutions and certification, and so on.

iv) YouTube

YouTube can be used for viewing, sharing and uploading video files. Teacher can make videos of experiments and activities and upload them on the YouTube and interact with students. A large number of videos on any experiment and activities already available on the YouTube can be reviewed and used for teaching-learning of physical science. Students can upload video file of any innovative experiment and project on the YouTube.

v) Podcast

A podcast is an audio or video file created and placed on the web for individuals to download and view or listen on their computers or digital media players. Podcasting is a means

of one-to-many audio distribution via the Internet. The term was coined from ‘iPod’ and or video ‘broadcast’.

A podcasting is a useful educational tool for two very different activities— receiving content from experts, and as a means of student media production. Podcasting is the generally accepted term for both audio and video files, but video file distribution is sometimes referred to as ‘podcasting,’ this provides a convenient, subscription based model for distributing educational materials. A list of educational podcasts to get an idea of what is available and how do they work, you can visit the site– www.enpweb.org. This site also describes simple steps on how to create a podcast by clicking on ‘cast’.

vi) Flicker

Flicker is an online photo management and sharing application. The basic service is free, which allows you an access of about 300MB per month. You can upload your pictures from your desktop or your camera phone. Then you can organise your photos by categorising them. These photographs related to activities, experiments, projects, model; chart, poster, etc. can be later used in teaching-learning process.

Flicker allows you to share your photos online, create groups that are public or entirely private. So, if you are participating in a collaborative activity with another class somewhere in the world, you can share your photos instantly. And if you want only your students to see the photos, you can maintain autonomy by creating a privacy setting. This aspect is so significant for education that every group can have its own discussion board. The class can ask questions about the photos and have meaningful discussions regarding the photos, and work with international students to generate discussions with them. Visit the website www.flickr.com to have an idea about it.

vii) Blogs

Blogs allow you to post homework and other discussion prompts. It keeps record of threaded discussions and arranges items by date. Attachments can be added to blogs too. Students can interact with the teacher online. A blog is a type of website or part of a website. Blogs are usually maintained by an individual with regular entries of commentary, descriptions of events, or other materials, such as graphics or video.

A blog is similar to an empty book. This book can be in the form of a sketchbook, a diary, a dictionary or portfolio— it depends on the content that we put into the book. The commenting feature of blogs allows for immediate feedback on a posting and active participation. The content that can be posted to a blog can be text, images, files, hyperlinks, audio and video.

Blogs can be classified on the basis of their purpose as Educational Blogs, Personal Blogs, Group Blogs, Press Blogs, Project Management Blogs, Library Blogs, Institutional Blogs, etc. Edublogs can be written by the teachers for improving classroom teaching-learning process, by the students to post their assessment tasks and by the policy makers who need to comment on education. Edublogs allow all students to participate in discussion on any topic.

Teacher acts as a facilitator in blog-based teaching and learning who moderates the discussion process to keep it on the right track. She can invite absent students, provide necessary teaching-learning materials and communicate with parents, link her class with another class somewhere else in the world, write comments, opinions, or questions on daily news items or issues of interests and showcase students' best writing pieces.

Teacher can also post teaching-learning notes for students, resources, and important links. In many countries students use mostly blogs instead of paper journals for writing assignments. Services like http://www.blogger.com; www.learnerblogs.org and http://epnweb.org/blogmeister/are free blogging services that students can join. Some are open to the public, others are password protected.

ICT Tool used in classroom

Student-teachers need to be empowered to use emerging ICT to explore the huge reservoir of knowledge, information and vast amount of data available anywhere in the world and to communicate with the learning communities of physical science for enriching their teaching-learning experiences. Student-teachers should be helped in acquiring a critical and constructive outlook to use technology for their project work, assessment of students' assignments, and designing teaching-learning experiences for learners.

Communication technology encompasses all forms of electronic communication in both digital and analogue form. The digital electronic devices include computers, CD, optical disc and

its players, storage devices, the Internet, cellular telephony and satellite broadcasting while analogue devices are largely limited to conventional radio broadcasts and audio tapes and tape recorders. Due to increase in bandwidth and the availability of various types of connectivity, the various technologies are converging into the broad field of Information and Communication Technology (ICT).

Inclusive education is the need of the day. We have to ensure that everyone in the classroom is able to understand the concept being transacted. A teacher usually faces situations where the learners need additional inputs to facilitate acquisition of concepts. Teacher also comes across students with special educational needs. She has to ensure their learning of science by making special efforts. In all these cases, ICT comes very handy.

This is an area that takes care of learners who need special attention like visually and hearing impaired, or learners learning with different paces and styles. Use of computers by visually impaired is now a common thing as most of the commands can be given through auditory mode. In addition to inputs, outputs can also be given in the audio mode for the sake of visually impaired students. Students with hearing impairment and others also can get help from digital resources. Appropriate digital package should be selected for them.

ICT in Classroom Instruction

The systematic use of ICT tools in classroom instruction makes the teaching learning process more effective and highly interactive. It has shifted the teaching –learning process from teacher – centered learning to student centered learning. Research has shown that high level of student and instructor satisfaction can be produced in ICT enabled learning process.

But the effective and efficient use of ICT depends on technically competent educators /teachers. They should be able to appreciate the potentiality of ICT and have positive attitude towards ICT.

The effective and efficient use of ICT in classroom instruction depends on:

a) ICT literacy of Teachers

b) Effective use of ICT hardware and software for teaching –learning activities

c) ICT – based pedagogy, online support, networking and management.

d) Adopting best innovative practices in the use of ICT.

Various ICT tools used in Classroom Instruction

The following are some of the technological tools used in teaching –learning process. These are, Computer-Aided Instruction (CAI), Computer –Assisted Learning (CAL), LCD projector, PowerPoint Presentation, Smart board, E-mail, Discussion forum, Wikis, Blogs Social Media, YouTube, CCTV, Video conferencing , Teleconferencing , Google earth, Google Maps , School tube, Teacher Tube, Flicker, Classroom 2.0 Ning etc.

Role of ICT in Education

Information Technology can provide a medium for teaching and learning and contribute flexibility to course provision.

The valid uses of information Communication Technologies are:

- Distance learning via electronic networks.
- Open learning through students controlled learning pathways.
- The process of changing teaching and learning styles by using a narrow range of Information Technology based facilities.

ICT make education system more productive, interesting, give more powerful instruction and also able to extent the educational opportunities to masses and creating information –rich learning environment.

ICT has made the class-room transaction more interesting. It has extended the teaching learning process beyond the boundaries of classroom. Students are now able to use laptop computers and wireless networks anywhere in campus.

A computer allows high speed information exchanges to occur with individuals within the institution as well as around the world. ICT brings the outside world in to the classroom teaching learning process, makes the things more realistic and thus helps the learners to understand the abstract thought very clearly.

ICT can improve the quality of higher education by promoting experimentations, researches and innovations, adopting the new strategies in the teaching –learning process and integrating the new information with the best practices.

ICT has also played a vital role in providing distance education very effectively. IT provides online delivery of courses, online assessment and online design courses to large no. of students at a time. The IC –based system like digital libraries; online courses, audio and video conferencing contribute significantly to the area of E- Learning and have opened a new era in the area of ELearning.

Benefits of ICT application in Education:

The benefits of ICT application in education can be summarized as bellow:

- ICT increases the access to education.
- It improves the quality of education by developing new ways of interaction and also makes teaching –learning process more interesting.
- It provides equal opportunities to the large number of learners to obtain education and information.
- It provides specialized tools for learners with visual, hearing or mental impairment, so that they learn and acquire knowledge at their own pace.
- It provides support to each and every school in sharing educational / learning experiences with the different schools throughout the country.
- It enables the distance education system to be more effective.
- It helps in promoting technology literacy to every citizen and especially to young stars.
- It provides opportunities for lifelong educations.
- It enhances the teacher's quality both in terms of teaching and research.

Benefits of ICT in Teaching Learning process:

- ICT can make the teaching learning process more interactive and effective.
- It helps in motivating the students towards their lesson.
- Learners can learn and work at their own pace just with little guidance from the teachers.
- ICT enables the learners to interact with the teachers, peers and experts on various issues outside the classroom.
- Learners can get various information very quickly.
- ICT also helps the teachers to evaluate the learner's progress and proficiency in certain skills.

- It can also remove the monotonousness of traditional classroom system.
- Encourages contact between students and faculty through social networking tools, blogs, wikis, text message etc, especially those students who are shy and unable to speak out in face-to- face classroom settings.

Thus, proper use of information and communication technology can shift the role of a teacher from providing information passively to creating and generating learning environment for individual student as per her requirement and learning style. This can help a student to construct her own knowledge. Students can conceptualise the situation and arrive at the solution of a problem. However, learning is definitely affected by the learning environment and context, attitude and self motivation of the learner. Therefore, it is important that the teacher provides learning experiences through developed materials, reviewed sites, reviewed web pages, and facilitate interaction with her peer groups.

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