

UNIT-IV

RESOURCE BASED LEARNING

Defining Educational Resource and Resource Centre (Area), Resource Bank, Resource Island, Resource Peninsula – Types of Resources, Users and their Role in a resource centre: Teacher, Learners and Technical Staff.

4.1 What are learning resources?

Learning resources are texts, audio video materials and digital aids that assist you in effective transaction of curricular content. The major learning resource is the text book prepared by central and state governmental educational agencies while a number of other learning resources are also available. These may be manmade, improvised or material available in the nature. You can also find learning resources in the immediate environment, it is also to be noted here that, with the advancement of technology, a number of digital learning resources are also developed. Some of the common learning resources are listed below:

| | | |
|-------------------------------|--------------------|-------------------------|
| Textbooks (Print and Digital) | Teacher Guides | Social networking Sites |
| Work books | Laboratories | Blogs |
| Activity Books | Models | Wikis, |
| Flashcards | Reference Books | Discussion forum |
| Posters | E-resources | Mobile learning |
| Educational games | Radio | E-text |
| Magazines and Periodicals | Television | E-content |
| Study Guides | LCD projector | Virtual reality |
| | Computer | OER |
| | Internet Resources | Second Life |

4.2 Importance and Use of Learning Resources

Learning resources serve many purposes. As you know, lecture method is the easiest/common method. Many times, subject contents are not conveyed appropriately to the

learners through lecturing style. But, the creative intervention of teachers can bring dynamism in the classrooms by employing learning resources in lecture method. The same is true for other teaching methods. Learning resources are imperative in teaching-learning situations due to the following features. These resources:

- help learners to be involved fully in the learning process as learning resources are powerful tool to gain and sustain motivation,
- facilitate learners to comprehend subject concepts effectively as they can correlate the verbal instruction with real experience,
- assist learners to learn effectively and remember concepts for long,
- help learners to comprehend concept with clarity and bring vividness in learning,
- help learners to concretize abstract concepts, and thereby enhances the comprehension,
- reduce verbal communication on the part of teachers, and
- help learners to develop inquisitiveness, curiosity and interest in learning.

Apart from the above stated points, learning resources are important because of the fact that learning is enhanced as learners experience hands on training and real practice. At this point, make note of the following figure that also validates the importance of learning resources.

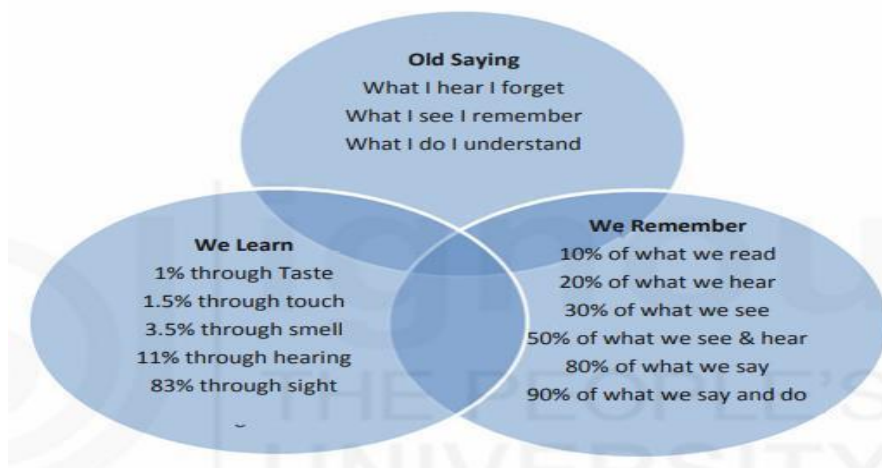


Figure 1: How we learn

As a mathematics teacher, you may look for options that would enable you to use learning resources effectively in your classroom.

Let us discuss an example.

Maya, a mathematics teacher was teaching the concept of ‘perimeter’ to her learners. What she did was, instead of verbally introducing the concept, she asked the learners to sit in groups. Thereafter, she asked them to complete the assignment given on the computer (The class is conducted in the computer lab and a group of five learners were assigned one computer). She was making use of one of the web resources.

4.3 Learning Resources from Immediate Environment

The learning resources that we have discussed above are readily available or are man-made. But, as a teacher, it may not always be possible to procure these resources for many reasons. In such cases, you can opt for natural (immediate environment) learning resources. Such resources are available in the classroom, own house or nature. Nature is the biggest reservoir of learning resources. These resources are also known to be improvised aids or improvised learning resources. Improvised learning resources are those resources that are prepared from waste material or material available in the immediate environment.

For example, if you want to teach 3D shapes, you can bring empty match boxes, unutilized utensils, and so on. Even can prepare boxes with unutilized cardboards, or thick paper cuttings, etc. Let us discuss an example of using learning resources from our immediate environment.

Mrs. Radhika, a secondary school teacher of mathematics decides to teach the concept of non-intersecting lines, secant and tangent of a circle in her class of Xth standard. When a circle and line is given in a plane, there are three possibilities: (i) the line will not touch the circle; (ii) the line will touch at two points or the line may touch at a single point. In the first case, we call the line segment PQ, a non-intersecting line, the second a secant, and the third a tangent of the circle. To teach these concepts, rather than drawing on the black board, she has used learning resources from her immediate environment. It is interesting to know what she used. Radhika brought a few sticks and bangles, which were kept unutilized at her home. With those objects, she was successful in organising the group activity and thereby helping the learners to learn the afore mentioned concepts

4.4 RESOURCES FOR TEACHING MATHEMATICS

I Resources Centre

- School
- Lab
- Library
- Display Board
- Catalogue Board

Aims& Objectives

- Encourage Community participation
- Develop a network (or) Establish a network of like minded
- Learning will be child oriented and activity based, so drop out can be reduce
- Involve teachers in the schools in an organized and effective way.
- To improve teaching and children's creativity
- Improve quality of education.

II Resource Bank

Where we collect materials called Resource Bank.

1. Reading Resources
2. Writing Resources
3. Language Resources
4. Math Resources
5. Self-Directed Learning

III Resource Island

- Charts, Map, Dictionary

IV Resource Peninsula

- It includes printed materials, digital or non-digital materials used for learning.

4.5 Types of Resources

PRINT RESOURCES

Newspapers

Newspaper can assist the Maths teacher in motivating the students by making more relevant Skills and concepts learned in the classroom. The newspaper can be a valuable tool for the Mathematics teacher in convincing students that consumer and basic maths skills are critical in everyday life. It is important that Mathematics teacher takes every opportunity to use current, relevant resource materials of Mathematics available in the newspaper to assist students in learning independently.

Uses of Newspapers

- Newspapers are an adult medium and students of all ability levels are inherently proud to be seen reading them.
- Newspapers deal with contemporary issues which are happening here and now and hence provide motivation for reading and discussion.
- Newspapers make learning „fun“.
- Newspapers are extremely flexible and adaptable to all curriculum areas and grade levels.
- Newspapers bridge the gap between the classroom and the “real” world.
- Newspapers build good reading habits that will last a lifetime.

Journals

A newspaper or magazine that deals with a particular subject or professional activity is called a journal. A journal is a magazine, many magazines have journal as part of their name. In journal we see personal experience and thoughts of eminent personalities, reports on things of special interest to a particular subject on regular basis.

Uses of Mathematics Journals

- Students have the opportunity to see the new Mathematical concepts.
- When students face problem, they try to solve with journals.
- Journals give greater depth in a topic.
- It provides opportunities for group work and discussion. Mathematics Journals in India
- Indian journal of mathematics
- Indian journal of pure and applied mathematics

- Journal for Ramanujam Mathematical society
- The journal of the India Mathematical society
- For east journal of Mathematical sciences.

Magazines

Magazine is a periodical publication containing articles and illustrations, often on a particular subject or aimed at a particular readership. Magazines are available in printed form or online form. They are generally published on a regular schedule and contain a variety of content. Mathematics magazine deals with Mathematical research articles and explains the doubts of the students and the teacher related to mathematics.

Mathematics Encyclopedias

The encyclopedia of Mathematics is a large reference work in mathematics. It is available in printed form or online. The first encyclopedia of Mathematics was published at Moscow in the year 1977. A new dynamic version of the encyclopedia is now available. It contains more than 8000 entries which include the newest advancements in mathematics. All entries will be monitored for content accuracy by members of an editorial board selected by the European Mathematical society.

AUDIO RESOURCES

Radio Talk

Radio talks are one-way communication media. Radio talks a very cost effective. It gives only auditory experience. Radio is the device for the transmission and reception of signals by means of electronic waves. Radio listening helps the student to add many information in student's knowledge bank. It exerts an influence on student's attitudes, appreciations, social thinking. Radio is an educational aid. It provides valuable auditory experience to the learners. Many specially arranged talks and discussions and information are broadcasted by the radio station in their scheduled institutional or general mass educational programmes. These programmes are very useful for students.

Audio Tapes

Audio tape is an effective recording device that calls for the use of auditory senses to convey the educational message to the learners. It consists of three parts.

1. Microphone

2. Amplifier

3. Reproducer Advantages

- It is quite helpful in the learning of some special subject like music, dramatics, language etc.
- It helps to avoid poor speech habits and to correct actual speech defects
- It helps to develop the conversation skill, expression power and techniques of effective dramatization.

DVDs/CDs

DVD (“digital versatile disc “or “digital video disc”) is a digital optical disc storage format. It was invented and co-developed by Philips, Sony, Toshiba, and Panasonic in 1995. The medium can store any kind of digital data and is widely used for software and other computer files as well as video programs watched using DVD players. DVDs offer higher storage capacity than compact discs while having the same dimensions. CD video used analog video encoding on optical discs matching the established standard 120mm (4.7 in) size of audio CDs. Video CD (VCD) became one of the first formats for distributing digitally encoded films in this format, in 1993. In the same year, two new optical disc storage formats were being developed. One was the multimedia Compact Disc (MMCD), backed by Philips and Sony, and the other was Super Density (SD) disc, supported by Toshiba, Time Warner, Matsushita Electric, Hitachi, Mitsubishi Electric, Pioneer, Thomson and JVC.

VISUAL RESOURCES

Picture

Pictures occupy an important place in visual aids; magazine pictures are easily and cheaply available from old magazines, calendars, newspapers, pamphlets and so on. They are more imaginative than the commercially produced wall charts and flash cards. The following points should be remembered while selecting pictures. They are

- Cost
- Clarity
- Suitability (big or small)
- Classifiable from the subject or syllabus point of view
- Limited or a variety of uses.
- A ready-made magazine picture album may be built up, in order that the teacher may not search for them every time he needs them.

Uses of Pictures

- It helps in motivating students on a new topic.
- Pictures of eminent Mathematicians can make the students familiar with them.
 - To know how Mathematical concepts are used in real life situations.
- We can interact with students

Charts

Charts are one of the most commonly used teaching aids in schools. The chart is a systematic arrangement of key facts or ideas in a logical sequence or representing ideas and facts in a pictorial or graphic form. The charts can be used for a variety of purpose such as

- Motivating the students
- Deriving formula and to explain
- Showing important key points in a lesson
- To understand the abstract Mathematical concepts

Posters

Printed materials convey a message to students. It will be in the form of posters or pamphlets. Posters are aimed towards masses to give information. Pamphlets give and remind messages. Generally, posters and pamphlets are always linked with a school function or meeting. Posters are cheaper and effective to communicate.

Key Points to Make a Poster

1. The theme idea - clearly stated
2. Way of presentation - simple and bold in letters
3. Wording - should be attractive
4. Color management - use attractive colors

Uses of Posters

- They add visual representation
- They allow for peer-to-peer interaction
- Students can learn from each other's posters
- They develop a wide range of key transferable skills.

Photographs

Photographs can be lively engaging and effective tools for learning in the class room. We live in a varied visual world where images are used in numerous situations to carry messages and communicate ideas. Students are much more comfortable with visual images than with verbal

Ones, a combination of visual and verbal images can enhance students' interest and involvement.

Uses of Photographs

- It helps in motivating students on a new topic.
- Photographs of eminent Mathematicians can make the students familiar with them.
- To know how Mathematical concepts are used in real life situations.
- We can interact with students

Flash Cards

A flash card is a rectangle shaped piece of card in which a Mathematical formula or something is written or some picture is drawn and flashed for a short time. Waste chart, waste greeting and invitation cards may be cut to near sizes usually 3"x10" size. Mathematical formula and a few steps may write under them. We can use flash cards in two different ways. In the first type, questions will be in one side and its answer will on the backside of the same card. In the second type, questions will be on separate cards and answers are also written on separate cards. After completing a lesson, teacher can prepare 15 to 20 flash cards and review the lesson and utilize it as teacher student, student-student form to review the content

Uses of the Flash Cards

- Some questions or steps are written on the flash cards. Students read them and answer the questions.
- Mathematical games can be conducted with the help of flash cards.
- It enables the students to recognize Mathematical concepts, formula etc

Models

Of all the visual aids, models are nearest to live or real experiences. Models are very helpful in making the subject clear to the students and they also give the students an idea of the actual shape etc. models are three dimensional representation. For example a^3 is the volume of the cube of side „a“ units and can be represented by the model of a cube.

ICT RESOURCES

Radio

Radio is an important teaching aid for English. Though radio is used for the purpose of entertainment, these days it is also used for teaching purposes. A comprehensive course in language can also be presented through radio.

Uses

- A radio is very useful to the language teacher. Because, it brings in expertise in language teaching whose instructions will be quite helpful to the students.
- All India radio broadcasts English and educational programmes and they also give the topic, date and time in advance, which is very helpful.

Television

Television is the most powerful medium of communication. It has revolutionized the method of teaching and learning. Now-a-days, it has become the most recent audio-visual aid for classroom instruction. This is a multi-sensory audio-visual aid, which can be effectively used for language teaching.

Educational Television

The television is called as the “queen of audio-visual aids”. It is one of the means of mass communication. It appeals to both the eye and the ear. There are three types of educational television programmes.

- Direct teaching enrichment programmes
 - Supplementary enrichment programmes
 - Demonstration type programmes
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- Secondary School Television (SSTV) Project
 - Delhi Agriculture Television (DATV) Project
 - Satellite Instructional Television Experiment (SITE)
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- Satellite based communication
 - Telephone clubbed with television
 - Video tapes and
 - Multimedia packages

Uses

- A large number of students can be given information at a time.
- It can help supplement class room oral teaching.
- It develops in them positivity and self-confidence towards the foreign language by listening and seeing the English channels.

Disadvantages

- It is a one-way communication only.
- Slow learners cannot cope up with it.
- Again, there is a dearth for teaching.

No one can explain the students before the programme commences.

Internet

Internet has become a very common word and it has also become very popular because it has made communication easy. When more than one computer is connected to share data among each other, it is called a network. There are three major classifications of networks. They are LAN, MAN and WAN.

LAN: Local Area Network. When the computers within the building are connected, then it is called LAN.

MAN: Metro Area Network. When the computers within the city are connected together to form a network, then it is called MAN.

WAN: Wide Area Network. When two or more LANs and MANs are connected together to form network, then it is called WAN.

Advantages of Network

- Network helps to share data among different computers.
- Huge amount of information can be exchanged
- The peripherals like printer, scanner can be shared among the computers **Multimedia**

Multimedia approach is one of the innovative methods that are aimed at improving the teaching-learning process. Some of the multimedia usages in Teacher Education are as follows

Usage of Multimedia in Teacher Education

1. Power Point Presentation

We can use the PowerPoint presentation to teach the lessons effectively. It consists of many elements. Some of them are

- Text
- Images
- Pictures
- Links
- After Animation, before etc.

2. CAI Packages

These packages are instructional techniques using the computer which follows for individual, individually paced and individualized instruction. Since the computers behaviour is dependent upon the responses of the student. In CAI package, the information is presented in a structured form. It can provide a method of instructions designed for self-directive study. It helps in improving skills or achieving objectives at all difficulty levels.

Devices used in CAI

1. Computer
2. Storage devices like; floppy, CD.,
3. Film projector
4. Multimedia projector; LCD
5. Input devices like; light pen, voice synthesizer, microphone, web camera etc.

3. Mobile

Learning

Mobile learning is one of the multimedia learning. It motivates to learn latest techniques or knowledge. It provides mobility of learning setting; not restricted to classroom learning. It consists of interactivity of the learning process and we can interact with others. It gives situational aspects of instructional activities. It integrates the instructional content all in one.

4. Smart Classroom

Smart classroom is a new type of classroom which replaced the formal and traditional classroom environments. It focuses on student's intellectual development not mere learning. Requiring Equipment's A smart class is a classroom that has an instructor station equipped with computer and audio-visual components.

Required equipments for smart classroom are as follows.

- Personal computer
- Overhead projector
- Wireless internet Access

- DVD player
- Smart board
- Speakers

Interactive Whiteboard

Interactive board is an instructional tool that allows computer images to be displayed on to a white board using digital projector. The instructor can manipulate the elements on the board by using his finger on the mouse, items can be dragged, clicked and copied and the lecture can handle notes which can be transformed into text and saved.

Uses of Interactive White Board/Smart Board

- In most of the schools in UK, interactive white boards replaced traditional blackboards, video, DVD players.
- It is an effective tool for brainstorming
- We can add notes and drawings and then save them

ICT NEED, IMPORTANCE AND USE IN LEARNING OF MATHEMATICS

ICT has become an inseparable component of teaching –learning process. What do you mean by ICT? ICT stands for Information and Communication Technology. ICT helps to store, process, disseminate, retrieve and transmit information with the aid of technological medium. The UNESCO defines ICT as “forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. It includes, not only traditional technologies like radio and television, but also modern ones like cellular phones, computer network, hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing”. Thus, ICT includes all technological gadgets that help to store, transmit and communicate information. What does ICT mean in educational context? Let us discuss with an example from class room context.

Imagine that a teacher wants to assess the progress of learning of his/her learners after teaching a particular concept, say for example; volume of a cube. In such a situation, the teacher will teach the concept and assess his/her learner using a computer made multiple choice tests. Thus, it is evident that the teacher has made use of computer to assess his/her learners in place of common paper pencil test. This is a way of utilizing ICT in the educational context.

Similarly, there are multiple situations in the educational process where you can employ ICT. ICT in educational process is mainly employed in four ways, namely;

- teaching learning,
- evaluation,
- administration and
- Professional development.

Let us briefly discuss these aspects. Generally, teaching is primarily focused on transaction of subject contents through lecture method, but with the emergence of technology, many technological tools are employed for the same. For example, virtual experiments, power point presentation, video conferencing, internet, etc are used during the teaching –learning process. Thus, ICT is widely adopted in teaching-learning processes. Similarly, in the case of assessment and evaluation, multiple tools and software are used. For example, online testing, computer tests, e –portfolios, etc., are used to assess learners’ progress. ICT also finds application in administration and management. Storing learners’ data in excel sheet, management information system (MIS) etc., are some among them. ICT are used in professional development programmes. Some of the latest technologies like, OERs, Massive Open Online Course (MOOC), Free and Open-Source Software (FOSS) assist various stakeholders to professionally update and helps in career development.

| Teaching and Learning | Administartion | Assessment | Professional Development |
|--|---|--|--|
| <ul style="list-style-type: none"> • E-content • OER • E-learning • Blog • Wiki • Mobile learning • Interactive white board | <ul style="list-style-type: none"> • Database • MIS • Record Keeping | <ul style="list-style-type: none"> • E-assesemnt • E-test • Online test • Computer tests • E-portfolio • Quiz tools • E-rubrics | <ul style="list-style-type: none"> • MOOCs • SPOCs • Discussion Forum • Online Communities • Online Courses |

Need and Importance of ICT

- The emergence of various learning resources has made the process of learning easy for learners. Apart from that, teacher can succeed in developing interest and motivation among learners with the aid of ICT learning resources. The black boards, charts, models, etc. are the learning resources of pre-digital era. In addition, teachers can also use digital learning resources. Some of the digital learning resources are

computer, e-books, educational software's, etc. Thus you may employ such digital learning resources to make learning effective for learners.

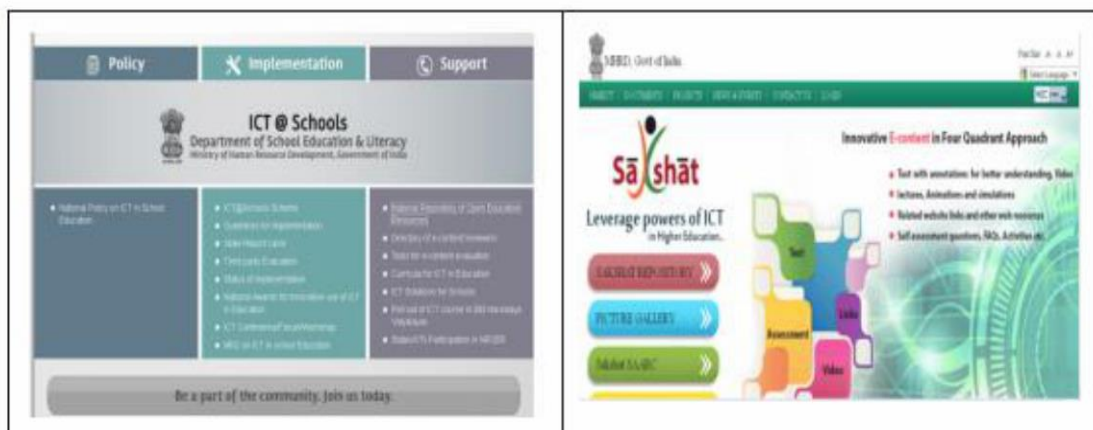
- The shift in learning styles of learners proves the relevance of ICT in teaching learning. It is common that, learners rely on traditional print text books to comprehend subject knowledge. But, today's learners are tech savvy and prefer to use multiple digital devices for learning. Thus you should supplement teaching with multiple ICT devices.
- Today constructivist approach of learning is practiced that help learners to develop their own understanding of subjects based on their previous experiences. In such a scenario, learners need to be supplied with multiple sources (preferably digital in nature) as a supplement to build their own knowledge and experiences of learning.
- Anywhere, any time learning is possible with the use of ICT. Learners get opportunity to access information at their pace and time. As they search for information, multimedia approach of education is encouraged. Thus, learners's weakness and strengths in learning can be easily identified and remediated.
- ICT access helps learners to obtain latest information/knowledge in different subjects.
- Multiple channels of communication are available that help learners to interact, communicate and share information. Thus, flow of information and knowledge is achievable that consumes less time.
- Learners can access various online repositories, online libraries, online books, etc. Thus, ICT provides opportunity for extra reading and rectifying abstractness of concepts.
- ICT offers various devices and learning sources that support the learning needs of learners with learning disabilities.
- ICT integrated education prepares learners to develop adequate skills and all-round development.
- The efficiency and smartness of learning is enhanced with the use of ICT. Learners learn better, comprehend knowledge with ease, retain the learned contents and easily apply them in practical situations. It helps in development of multiple skills both cognitive and physical.

- ICT helps teachers to present learning contents in multiple forms. The teaching of complex concepts is made easy for learners with the aid of ICTs. The theory of self and independent learning is promoted

Use of ICT in Learning of Mathematics

In this section, we will discuss some of the ICT resources and method of integrating them during teaching sessions. ICT includes multiple learning resources and technologies starting from the radio to the most modern augmented reality (virtual learning) like radio, television, LCD projector, computer, internet communication, social networking, blogs, wikis, discussion forum, mobile learning platforms, e-text, e-contents, virtual reality, OERs, MOOCs, etc. The National Policy on Information and Communication Technology (ICT) in School Education published in the year 2012 and National Mission on Education through ICT (NMEICT)-2009, have advocated the adoption of ICT at school and higher education level. The National Policy on ICT in School Education (2012) recommended web-based digital repositories to host a variety of digital content, appropriate to the needs of different levels of learners and teachers. The National Repository of Open Education Resource (NROER) is one among them. NROER is a collection of videos, audio files, images, documents and interactive modules for all school subjects and grades in multiple languages. Similarly, “e-Pathshala” (Web-site containing approximately 364 eBooks, 137 videos and 100 audios this number is increasing day by day) is another major initiative of e-learning for school education. One point to be stressed at this juncture is the creativity and thought process of you as a teacher that would enable you to utilize technology in teaching. Technology enabled learning is a major impact of ICT. There is a variety of ways by which ICT can be utilized; it could be blog, wiki, e-content, interactive white board and so on.





Naveen, a mathematics teacher, of a government school, utilized ICT in teaching ‘ratio among the volumes of right circular cone, hemisphere and right circular cylinder’. To teach the same concept, Naveen had two options; either lecture method or blended approach (using ICT). He went for the second option. What he did was that after the theoretical explanation, he realized, learners are confused and they found it difficult to comprehend the concept. At such a point, Naveen utilized the OER repository of NCERT (Two screen shots of the OER). This video is showing an activity, which help learners to understand the ratio among the volumes of right circular cone, hemisphere and right circular cylinder. Using this video presentation, Naveen could easily help learners to gauge the described concept.

Thus, the use of NROER is an example of utilizing ICT in teaching –learning.

COMMUNITY RESOURCES

Fieldtrips

Fieldtrips is an important means of effective learning. Fieldtrips provide the students with opportunities to have direct experience with out of school life. For the fieldtrip to be productive and useful they should be properly planned, executed, supervised, evaluated and followed up. For fieldtrips the students may be taken to places of Mathematical interest such as post office, banks, railway stations, workshops, agricultural fields, industries etc.,

Advantages of Field trips

- They provide rich and meaningful experiences to the students
- They provide real life experiences in planning, executing, observing, analyzing, interpreting etc.,
- Fieldtrip links the school and community.

Mathematics Exhibition

Mathematics exhibition explores the many wonders and uses of Mathematics in our life's exhibition focuses on different aspects of mathematics. It also deals with some of the greatest Mathematical minds and their contributions. Mathematical concepts are explained with the help of tools to ordinary people.

Objective of the Exhibition

- To provide a forum for students to pursue their natural curiosity and inventiveness to quench their thirst for creation.
- To develop critical thinking and scientific attitude.
- To apply Mathematics and information technology to solve problems of everyday life.

Mathematics Laboratory

Practical work should form a prominent feature in any subject. For this Mathematics laboratory is essential in the school. The knowledge imported without experiment or evidence remains superficial. It is used to learn Mathematical concepts and helps in training the students for practical applications of Mathematical facts and principles in their life. "Mathematics laboratory is a unique room or place, with relevant and up-to-date equipment, known as instructional materials, designed for the teaching and learning of mathematics and other scientific or research work, whereby a trained and professionally qualified person (mathematics teacher) readily interacts with learners on specified set of instructions" (Adenegan,2003). Math lab is a place where learners get opportunity to engage with mathematical objects, experiment mathematical theories, solve mathematical puzzles and problems, play mathematical games, experience hands on training, and so on. The material or equipment that can be found in the mathematics laboratory includes, among others, constructed (wooden/metal/plastic made) mathematical sets, charts and pictures, computer(s), computer software, audio-visual instructional materials such as projector, electronic starboard, radio, television set, tape recorder, video tape, etc, solid shapes (real or model), bulletin board, three-dimensional

aids, filmstrips, tape photographs, portable board or whiteboard, abacus, cardboards, tape measure, graphics, workbooks, graphs, flannel boards, flash cards, etc (Adenegan,2003).



Math lab consists of a number of materials and objects. Mathematics corner is a miniature form of math lab. Math lab is highly organised, consists of several objects/materials/instruments and requires specialized skills in developing them, but math corners are simple and contains few mathematical objects and items. You can setup a math corner at the corner of any other lab or on the corner of classrooms. Usually, math corner is a place where learners find the ordinary/common kinds of mathematical items and you can utilize these items during the classroom interaction. In a way, math corners include math related teaching-learning aids. It is to be noted that, the objects found in math labs can also be found in math corners.

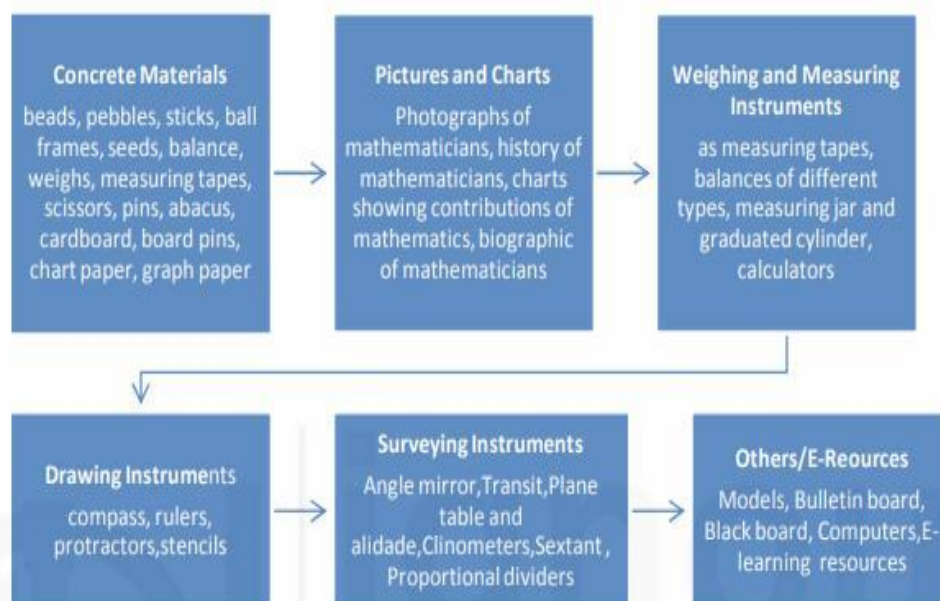
Equipment's of Mathematics Laboratory

- Charts and pictures
- Weighing and measuring instruments
- Drawing instruments
- Models
- Computer
- Proportional divisions
- Calculators
- CDs & Video Tapes

Importance and Uses of Mathematics Laboratory

- It helps learners to comprehend mathematical concepts effectively by utilizing concrete objects and experiencing real situations.
- Learners can test and experience the theoretical knowledge and discover different mathematical properties.
- It enhances the interest and motivation of learners to learn mathematics.
- Math labs provide objects and materials, which help learners to relate concepts with their daily life activities and nature.
- Individual learning is promoted while exploiting math labs as learners engage in exploration of mathematical contents in their own way.
- The cognitive development is supported and enhanced as learners exercise both mind and body by engaging in learning activities.
- The teacher can demonstrate learning concepts by connecting with multiple learning resources present in the math labs.
- It helps in the development of skill of enquiry and critical thinking.
- The principle of ‘learning by doing’ can be practiced by learners.

Now, let us see the objects that are generally found in math labs. It is your obligation as a mathematics teacher to initiate steps to develop math labs in your school. It is not necessary to have many items instead the basic objects must be organised in the lab. While developing math labs, the following objects/materials/equipments can be included in it.



Uses

- It helps in making clear understanding of abstract concepts
- It helps in developing the habit of verifications
- Practically doing the things retains concepts in the mind of the students for longer time.
- It helps in creating interest of the students in the learning of mathematics.

Mathematics Club

Math clubs/forums are to be viewed from two angles; a learning resource and as a place to engage learners in extracurricular activities. Learning resource in the sense that mathematics teachers can utilize math club/forum to engage their learners to discuss, debate and deliberate on various topics of mathematics. On the other hand, different co-curricular activities such quizzes, study tours etc. can be organised by mathematics clubs/forum. Math club/forum is a group of individuals getting together to organise events, discuss, debate on various topics pertaining to mathematics. The club arranges various events such as birthdays of mathematicians, math days etc. Also, the clubs and forums are engaged in organising discussions, debates, seminars, study tours, etc. Ultimately, math clubs/forums help learners in developing interest and motivation in mathematics learning. There are different ways of involving learners in learning mathematics; math club/forums play a major role. So as a math teacher it is your duty to initiate processes to develop math clubs/forums. The math club/forums work under the guidance of the math teacher. A Mathematics club plays an important role in motivating the students to learn Mathematics with interest and involvement. Though the learning that takes place in a Mathematics club is informal in nature, it is meaningful. In a Mathematics club, the student chooses the activities on his own and pursues them on his own interest in a free and relaxed manner contrary to the atmosphere prevailing in a classroom. Club provides of lot of freedom of expressions for the students and it supplements classroom learning.

Importance of Maths Club

- Math clubs/forum help learners to engage in various activities related to mathematics learning.
- Facilitate and arouse interest and motivation in learners to learn mathematics.
- The leisure time can be properly utilized by involving in programmes organised by math clubs/forums.
- Learners are exposed to various activities of math clubs/forums thus help them to test theories learnt in their math classes.

- Provide opportunity to learners to initiate different programmes.
- Help learners to enhance skill of leadership, problem solving, joint responsibility, hard work, etc.
- Math clubs/forums help learners to engage in activities where they can discuss, contest and ponder over various themes of mathematics.

Functions of Mathematics Club

- Mathematics club helps in the proper utilization of leisure time.
- It helps in creating and maintaining student's interest in mathematics
- It helps in developing heuristic and problem-solving attitude among the students
- The informal knowledge acquired through Mathematics club activities supplements classroom learning.
- Celebrating birth days of eminent mathematics.
- Writing articles related to Mathematics for the school magazine
- Preparing exhibits for the bulletin board.
- Educational talks, lectures, key note addresses by renowned mathematicians, teachers, math specialists, etc.
- Celebration of birth days of mathematicians and organization of other important mathematical events, math days, etc.
- Discussions and debates on various topics and issues related to mathematics.
- Quiz programmes.
- Conduction of math fairs, math olympiads, exhibitions, etc.
- Exhibition of mathematical models, aids, charts, etc.
- Seminars and workshops.
- Publication of magazines and periodicals on weekly/monthly/yearly basis.

Qualities of a Good Mathematics Text Book

Text books take an important part in teaching learning activities. Text books help student to attain their goal. A good Mathematics text book not only satisfies the syllabus but also it must be understandable to students. Generally, a Mathematics text book should have the following three characteristics.

- It should have quality in materials used
- It should be useful to teachers
- It should be useful to students

A good Mathematics text book should have the following properties.

- Text books should be student centred. There should not be any hindrance in understanding the subject matter.
- Text book wrappers, quality of paper and size of the letters should create interest in reading the book.
- Content should be written in logical and psychological way. It should be according to Mathematics syllabus.
- Text book should be without any spelling mistakes.

Uses of Text Books to Teachers

- Text books are written on par with syllabus. This helps the teacher as a guide to teach the content.
- To give class work, homework and assignments as per the student's knowledge, text books are helpful
- To prepare Unit Tests and Achievement Tests, text books are very useful to teachers.
- Text books are very useful in writing lesson plan.
- To create lively classroom activities, text books are useful.

Uses of Text Books to Students

- To recall and read the content done in the class, text books are helpful
- Text books are very helpful to revise and practise.
- It helps for self-learning and to solve problems
- New information, tabular columns and explanations are given in text books. This creates interest in education.
- To read and understand the text according to the learning skill of students, text books are helpful.
- It helps in meaningful learning
- When a student takes leave from school for some reasons text books are used to read the lessons at home.

SELECTION AND USE OF APPROPRIATE MEDIA/LEARNING RESOURCE

According to Romiszowski (1997) the following factors influence the selection of media:

1) Task Factors: It refers to the nature of job in hand i.e., what are the learning objectives? What are the behavioural changes that the teacher wishes to develop in learners? What are the pedagogical approaches going to be followed for transacting the curricular content? What time should be devoted to the process? etc.

2) Learner Factors: Learner factors include learners' age level, motivational characteristics, personality and individual differences, willingness for learning, etc. Today, inclusion is

emphasized in classrooms. In such classrooms, learners with special needs are taught along with normal learners. Thus, while selecting the media/learning resource for teaching, care must be taken to meet the learning demands of both normal and learners with special needs.

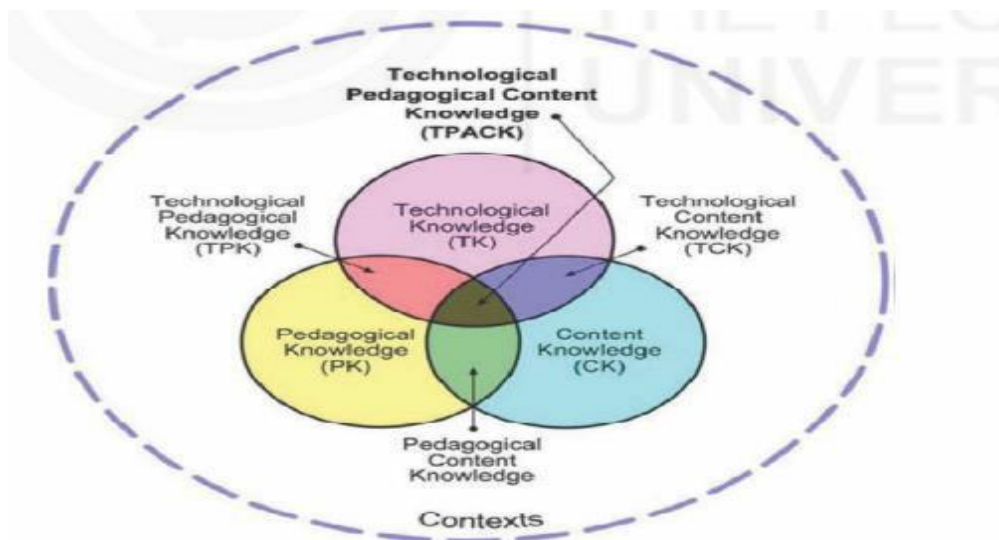
3) Economic/Availability Factors: It includes the cost of learning resources/media, availability of media, working conditions of the media and so on. As we know, a calculator is less costly compared to a computer. So, if a mathematics teacher wishes to teach concepts related to arithmetic calculations, she/he may prefer simple calculators in place of computer. This saves energy, time, complexities, etc. Similarly, situations that require a camera, may utilize mobile cameras which are handy and mostly available with teachers.

Now, let us discuss a practical example that interconnects all these three factors. To teach the concept ‘bisector of a given angle’, the following procedure may be followed. So, the task factor involved is ‘helping learners to comprehend the process of drawing bisector to a given angle’. In this case, the teacher anticipates that at the end of the class, learners would be able to draw bisectors to any given angle. To teach the concept, the teacher has 40 minutes and she/he planned a group activity. Why group activity? The number of learners in the class was 40 and it was difficult for her to provide computer to each learner. Thus, the learner factor involved here is the ‘number of learners in the class’ and economic/availability factor is the distribution of computers as computers are readily available in the computer laboratory. After deciding on the medium, the teacher directs learners to complete the task mentioned in the self learning module. The module was set up in the computer before. This is an example that shows how a mathematics teacher employed the three factors discussed above.

Apart from the three factors discussed, you must also understand about the concept of Technological Pedagogical Content Knowledge (known as TPACK), a framework that help teachers to adopt technology in teaching learning. In TPACK, ‘T’ stands for technology and refers to the knowledge of teachers in technology that he /she wishes to employ in his/her classroom. What are these technologies; for example virtual learning, web 2.0 & 3.0 applications, internet, audio clipping, video shots, e-contents, interactive whiteboard, OERs, etc. ‘P’ is pedagogy that represents the knowledge of teacher in pedagogical aspects of teaching. What are those pedagogical aspects? For instance, the knowledge in various teaching methods, techniques, styles of teaching, developmental stages of learners, etc. The letter ‘C’

denotes the content knowledge. As you are aware, a teacher definitely should have mastery over the subject. The content knowledge includes the knowledge in terms, concepts, principles, theories, law, etc.

The TPACK framework is a guideline that every teacher can follow in selecting the media. Before coming to that, let us explore a few more basic aspects of TPACK frame work. In general, TPACK is the knowledge of an individual in three components namely, technology, pedagogy and content. Apart from that, TPACK also elucidates a few other components such as Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) and Pedagogical Content Knowledge (PCK), as shown in figure given below. Thus, TPACK denotes the interconnection of the individual components namely technology, pedagogy and content. So, being a teacher, you must ensure that, while a technology is selected for teaching a particular concept, these seven factors must be taken care of.



Qualities of a Mathematics Teacher

“A teacher can never truly teach unless he is still learning himself. A lamp can never light another lamp unless it continuous to burn its own flame”. –

-Rabindra Nath Tagore

Teaching is one of the essential jobs of a teacher, besides his other involvements with students inside and outside the classroom, laboratory, library, playground etc. he has to be an equalization teacher. “A teacher has to help the bud into full bloom and not to make paper flowers to satisfy his whim”.

- Sarvapalli Dr. Radhakrishnan

The following qualities are required in a Mathematics teacher besides his academic and professional requirements.

- Mastery over the subject
- Knowledge of psychology
- Well equipped with methodology of teaching mathematics
- Faith in the subject
- Well-equipped in human qualities
- Classroom activities
- Knowledge on various fields of Mathematics
- Fluency in expression
- Adequate general knowledge
- Well-equipped in teacher qualities
- Punctuality
- Professional enrichment

Role of Teacher

In traditional classrooms his role is very simple. He was at the centre and in active mode. But in this digitalized society there is a great shift in his role. Now his role is becoming so complex in nature. They are expected to become technologically oriented. Some important roles of teachers can be listed below:

1. As a facilitator he must help his learners to develop the positive attitudes towards the changes that are taking place in their environs and also make them ready to adjust and adapt these changes.
2. As a knowledge provider his learners must be exposed to unending process of knowledge and make them capable to choose b/w the right and wrong at the same time.
3. As a guide he must enable his learners to get acquainted with new ICT based digital knowledge and advancements.
4. As a trainer his learners must be trained and mastered upon the new technological tools or instruments and make them ready to utilize all these at the maximum.
5. As a capacity builder his learners must be capacitated with all those practicum and life skills that are necessary for living a happy life.
6. As a keen observer his learners must be observed for their activities during the exposition of new and vast world knowledge.
7. As a learner he must update his knowledge to keep pace with global knowledge.
8. As a team member he must work by taking the help of his fellow teachers.