Advanced Educational Technology

Dr. A. Sivakumar
M. Boobesh Guptha

Advanced educational technology promises to improve science teaching and learning. To achieve the posited outcomes, however, teachers must have access to, know how to, have the skills to and want to use the proposed advanced educational technologies in teaching. Educational technology is the use of both physical hardware and educational theoretics. It encompasses several domains inc luding learning theory, computer-based training, online learning, and where mobile technologies are also used, m-learning. Educational technology have brought in a convergence of the media along with the possibility of multi-centric participation in the content- generation and disseminative process. This has implications not only for the quality of the interchange but also for drastic upheavals of centre-dominated mindsets that have inhibited qualitative improvement.

Dr. A. Sivakumar holds the Degrees of M.Sc., M.Ed., M.Phil (Education)., Ph.D (Education). He is working as an Assistant professor, KSR College of Education, Tiruchengode, Namakkal. He has been serving as Guest Lecturer, Department of Educational Technology, Bharathiar University, Coimbatore, Tamilnadu. He is specialized in Computer Education, Educational Technology, Educational Psychology, Teacher Education and SPSS Package. He published 32 papers and participated 23 conferences in Tamil Nadu. He published 7 books in the field of education.

M. Boobesh Guptha is a Ph.D Research Scholar, Department of Education, Bharathiar University, Coimbatore, Tamilnadu. His areas of interests are Educational Technology, Educational Psychology and Teacher Education. He published 5 papers and participated 10 conferences in Tamil Nadu.

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PREFACE

Advanced educational technology promises to improve science teaching and learning. To achieve the posited outcomes, however, teachers must have access to, know how to, have the skills to and want to use the proposed advanced educational technologies in teaching. Educational technology is the use of both physical hardware and educational theoretics. It encompasses several domains inc luding learning theory, computer-based training, online learning, and where mobile technologies are also used, m-learning. Educational technology have brought in a convergence of the media along with the possibility of multi-centric participation in the content- generation and disseminative process. This has implications not only for the quality of the interchange but also for drastic upheavals of centre-dominated mindsets that have inhibited qualitative improvement. Modern educational technology has its potential in the educational institutions, in the teaching of subjects, in examinations, in research, in systemic reforms, and, above all, in teacher education, overcoming the conventional problems of scale and reach through online, anytime, anywhere. There exists today a well-established publishing industry, including desktop publishing, with know-how and capabilities in producing kits, teaching aids, etc. There also exist production capabilities for audio and video, multimedia, broadcast channels, Internet connectivity, trained manpower, and institutions with these mandates that can be leveraged to address the challenges of education. Alternative models of education such as distance and open-learning, on-demand education, and other such exible models of learning, will have to be tried and tested. Flexible systems, futuristic curricula and a twenty- rst-century career orientation have become a necessity for today's young people. There is an urgent need

to convince the educational system, which should play an important role in engineering the teaching-learning situation and to make it a more meaningful experience for both teachers and their pupils. The Indian perspective on educational technology essentially requires looking at the scenario related to the evolution of educational technology in the country and the periodic changes carried out in policies and curricular concerns. This look at the development of educational technology in India. In the current scenario, which involves efforts from both the Government and Non-Government organizations, should provide several pointers towards how educational technology could be used fruitfully now, and in the future, to attain the desired educational goals and to enhance meaningful learning in the rapidly changing world of the 21st century. These issues and concerns are discussed in the succeeding pages. While looking at policy changes and research findings, the Focus Group found that the term educational technology is construed differently in different programmes and by different agencies. We have, therefore, decided to begin by clarifying both the term and all it implies. It consists of five units which deal with Communication technology in education- meaning, scope and choice, Technology in language teaching, Educational technology for formal, informal and nonformal systems in learning: concept and scope, Programmed learning; theoretical considerations and Computer in education. This book is dedicated to all students. Suggestions and comments to improve the contents of this book will be welcomed.

Dr. A. Sivakumar
M.Sc., M.Ed., M.Phil., Ph.D
Assistant Professor,
KSR College of Education,
and
M. Boobesh Gupta,
M.Sc., M.Ed.
Ph.D Scholar,
Department of Education,
Bharathiar University

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ABOUT THE AUTHORS

Dr. A. Sivakumar holds the Degrees of M.Sc., M.Ed., M.Phil (Education)., Ph.D (Education). He is working as an Assistant professor, KSR College of Education, Tiruchengode, Namakkal. He has been serving as Guest Lecturer, Department of Educational Technology, Bharathiar University, Coimbatore, Tamilnadu. He is specialized in Computer Education, Educational Technology, Educational Psychology, Teacher Education and SPSS Package. He published 32 papers and participated 23 conferences in Tamil Nadu. He published 7 books in the field of education.

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Chapter-1

MODERN COMMUNICATION TECHNOLOGY IN EDUCATION-MEANING, SCOPE AND CHOICE

1.1 SYSTEMS APPROACH TO INSTRUCTION AND INSTRUCTIONAL DESIGNS

1.1.1 Educational Technology as a systems approach

All attempts made to define the concept of educational technology as an area of study involving the application of technologies emerged from the application of theories of learning and development as well as information and communication technologies have not been comprehensive enough without a theoretical grounding in the social context. The use of these technologies has to be grounded in a theoretical foundation provided by a systems perspective. The field of educational technology shares the same difficulties and struggles involved in defining itself as one comes across while defining other social sciences and applied social sciences. This section attempts to provide the learner with adequate theoretical understanding about systems theory in order to have a more comprehensive view of the field of educational technology.

The systems approach to educational technology the systems approach to the design and analysis of teaching/learning situations is the basis of the great majority of modern educational technology-related developments. However, the terms system and systems approach are themselves jargon terms that can have a variety of interpretations. Let us therefore take a look at these terms in order to define the way in which the teacher are to use them.

In general systems theory, a system is any collection of interrelated parts that together constitute a larger whole. These component parts, or elements of the system are intimately linked with one another, either directly or indirectly, and any change in one or more elements may affect the overall performance of the system, either beneficially or adversely.

The Systems Approach in Technology Education

The traditional approach in engineering or technology teaching is bottom- up, i.e. from component to system. For example, the order of the courses in a typical communications engineering program is: mathematics (calculus, etc.), science (physics, etc.), electricity basics, components, linear circuits, modules, basics of transmission and receiving, subsystems, and communications systems. In most traditional curricula, both in high school and undergraduate programs, the stage of dealing with a complete system is sometimes not fully addressed by the curriculum.

The larger, more complex, more dynamic and more interdisciplinary the specifications for a technological systems get, the harder it is for a lone engineer, as skilled as the student or the student may be, to design a complete system. Given this, students and their teachers, who are not required to be proficient in engineering, but who should be technologically literate, should not be expected to know so much as trained engineers as they go about manipulating entire technological systems. Based on the systems thinking approach, what follows is a proposal for a way to teach technology and instill technological literacy without first teaching the details (for instance, electricity basics and linear circuits for electronics, or calculus and dynamics basics for mechanical engineering).

The central idea in this premise is that complete systems can be handled, conceptually and functionally, without needing to know their details. According to this approach, when trying to develop technological literacy in students who are not required to be proficient in engineering, the favored teaching strategy is top-down. In other words, the focus must be on the characteristics and functionality of whole systems and the interdependences of the subsystems.

This new technology has influenced the educational administration and organisation to a great extent. This is the modern approach. It acts as a link between hardware and software approach. It is also known as

'Management Technology'. It has brought to educational management a scientific approach for solving educational administrative problems. It is essentially a new management approach, influencing management decisions in business, industry and education. Education is regard as a system and system approach is a systematic way of designing an effective and economical educational system.

System is defined in the dictionary as "an assemblage of objects united by some form of regular interaction or inter-dependence; as organic or organised whole as the solar system or a new telegraph system". System may be divided into three broad categories. For instance, there are natural systems as solar system; there are systems which have been designed by man as telegraph system and lastly, there are systems which are combinations of natural and man-made systems like hydro-electric plants or modern dairies.

System approach is a systematic attempt to coordinate all aspects of a problem towards specific objectives. Webster's dictionary defines a system as "a regularly interacting or independent group of items forming a unified whole." The characteristics of a system of may be explained with the help of an example – various parts of the digestive system may be called as components of digestive system. Every component of the digestive system contributes to as supports in functioning of the digestive system as a whole.

In the context of education, system is a unit as a whole incorporating all its aspects and parts, namely, pupils, teachers, curriculum, content and evaluation of instructional objectives. The teaching-learning process is viewed as communication and control taking place between the components of a system. In this case, the system is composed of a teacher, a student and a programme of instruction, all in a particular pattern of interaction.

The System Approach focuses first upon the learner and then course content, learning experiences and effective media and instructional strategies. Such a system incorporates within itself the capability of providing continuous self-correction and improvement. It is concerned with all elements of instruction including media, including hardware and software. Its purpose is to ensure that the components of the organic whole will be available with the proper characteristics at the proper time to contribute to the total system fulfilling the objectives.

In the systems approach to instruction, the teacher has to plan completely the utilization of selected resource material and the classroom activities. The teacher should have a good overall view of the subject, know his/her limitations, know all about his/her pupils and the individual differences in their learning capacities and plan accordingly. The system approach involves continuous evaluation of learning outcomes and utilization of knowledge gained by analysis of results of evaluation to suitably modify the plan of approach to achieve the stated objectives.

Major steps in the systems approach in education are

1. Formulating of specific instructional objectives to be achieved and defining instructional goals,
2. Deciding appropriate media to achieve these goals,
3. Defining learner characteristics and requirements,
4. Selecting appropriate methods suitable for effective learning to take place, 5. Selecting appropriate learning experiences from available alternatives,
5. Selecting appropriate materials and tools required,
6. Assigning appropriate personal roles for teachers, students and supporting staff,
7. Implementing the programme,
8. Evaluating the outcome in terms of original objectives measured in student performance and 10. Revising to improve efficiency of the system to improve students' learning.

Advantages of systems approach

(*i*) Systems approach helps to identify the suitability of the resource material to achieve the specific goal.

(*ii*) Technological advance could be used to provide integration of machines, media and people for attaining the defined goal.

(*iii*) It helps to assess the resource needs, their sources and facilities in relation to quantities, time and other factors.

(*iv*) It permits an orderly introduction of components demonstrated to be required for systems success in terms of student learning.

(*v*) It avoids rigidity in plan of action as continuous evaluation affords desired beneficial changes to be made.

Limitations of systems approach

(*i*) Resistance to change. Old ways are difficult to erase. There is always resistance to any new method or approach.

(*ii*) Involves hard work. Systems approach requires hard and continuous work on the part of school personnel. Some are not prepared for the extra load.

(*iii*) Lack of understanding. Teachers and administrators are still not familiar with systems approach. Though it has been successfully implemented industry, it has still to make headway in education.

1.2. AUDIO VISUAL TECHNOLOGY: PROJECTED AND NON PROJECTED AIDS

Audio-visual aids help in holding the attention of the receiver. When these aids move, they motivate to take action, create interest, increase permanency of learning and make the job of teaching and communication easier. In the adoption process, the teacher are required to use individuals, aids and methods in combination. In this chapter the teacher shall discuss about the non-projected aids, their uses, advantages and disadvantages. The classification of aids was discussed in the preceding chapter. However, some of the important non-projected aids that are discussed ahead are:

- Diagrams,
- Posters,
- Flash cards
- Flannel graphs,
- Flip Charts,
- Black boards and
- Bulletin Boards

Audio visual aids

Audio visual material must be seen in their relationship to teaching as a whole and to the learning process as a whole, until the teacher understands the relationship between audio visual material and teaching learning process. Audio visual materials are produced, distributed and used as planned components of educational programs. It helps the

process of learning that is motivation, classification and stimulation. A.v. aids are multisensory materials which motivate and stimulate the individual. It makes dynamic learning experience more concrete realistic and clarity. It provides significant gains in thinking and reasoning.

Audio visual aids are sensitive tools used in teaching and as avenues for learning. These are planned educational materials that appeal to the senses of the people and quicken learning facilities for clear understanding.

Definitions

(*i*) According to Kinder S. James: Audio visual aids are any device which can be used to make the learning experience more concrete, more realistic and more dynamic.

(*ii*) According to Burton: audio visual aids are those sensory objects or images which initiate or stimulate and reinforce learning.

(*iii*) According to Carter.v.Good: audio visual aids are those aids which help in completing the triangular process of learning that is motivation, classification and stimulation.

(*iv*) According to good's dictionary of education: audio visual aids are any thing by means of which learning process may be encouraged or carried on through the sense of hearing or sense of sight.

(*v*) According to Edger Dale: audio visual aids are those devices by the use of which communication of ideas between persons and groups in various teaching and training situations is helped. These are also termed as multi sensory materials.

(*vi*) According to McKean and Roberts: audio visual aids are supplementary devices by which the teacher, through the utilization of more than one sensory channel is able to clarify, establish and correlate concepts, interpretations and appreciations.

(*vii*) According to KP. Neeraja: an audio visual aid is an instructional device in which the message can be heard as well as seen.

Purposes

- To supplement and enrich teachers own teaching to make teaching-learning more concrete.
- To serve an instructional role in itself.

- To create interest among the group.
- To make teaching as an effective process.

Advantages

- Audio Visual Aids helps in effective perceptual and conceptual learning.
- Audio Visual Aids helpful in capturing and sustaining attention of students.
- Audio Visual Aids arouses interest and motivates students to learn.
- Audio Visual Aids is helpful in new learning.
- Audio Visual Aids helps in saving energy and time of both the teacher's and students.
- Audio Visual Aids provides near realistic experience.
- Audio Visual Aids can meet individual demands.
- Audio Visual Aids is useful in for education of masses.

Characteristics of good teaching aids

Teaching aids should be

- Meaningful and purposeful
- Motivates the learners
- Accurate in every aspect
- Simple and cheap
- Improvised
- Large in size
- Up-to-date
- Easily portable
- According to intellectual level of students Sources of A.V.Aids:
- Government
- Educational institutions
- Professional organizations
- Non-governmental organizations
- Voluntary organizations(national and international)

- Commercial producers of educational material
- Commercial advertisement
- In nursing organizations like TNAI, INC...etc.

Classification of audio visual aids

Various classifications are given for Audio visual aids according to the type of projection by various authors.

Classification of Audio visual aids Aids

- Audio aids:Audio materials are those which can be heard. Ex: - radio, tape recorder, walkman, Headphones.
- Visual aids: these are helpful to visualize the things. Ex:- graphic aids, 3d-aids, display boards, and print material.
- Audio visual aids: these aids can be heard and seen simultaneously. Ex: - projected aids, TV, films.

Classification of Audio visual Aids

- Simple Audio visual Aids: It includes graphic aids, display boards, 3d-aids, print material...etc.
- Sophisticated Audio visual Aids: includes audio-visual aids.

Principles to be followed for the effective use of audio visual aids

- Audio visual materials should function as an integral part of the educational program.
- A.v. aids should be centralized, under specialized direction and leadership in educational programs.
- An advisory committee consisting of representative from all areas of curriculum should be appointed to assist in selection and coordination of a.v. materials.
- An education program should be flexible.
- A.v. material should be carefully located to eliminate duplication, easy accessibility and convenient use.
- A.v. material should be available whenever and wherever they needed for effective utilization as an integral part of curriculum.

- Budget appropriations should be made regularly for a.v. education programs.
- Periodic evaluation to be done to assess the function of, utilization and expenditure of the program.

1.2.1 Projected audio visual aids

Over head projector

The over head projector is the most used in all Audio visual aids. It projects transparencies with brilliant screen images suitable for use in a lighted room. The teacher can write or draw diagrams on the transparency while the student teaches; these are projected simultaneously on the screen by the OHP.

During presentation

- Keep the screen above the heads of the participants.
- Keep the screen in full view of participants
- Make sure the teacher are not blocking any ones view when presenting.
- Darken the room appropriately by blocking out sunshine and dimming near by.
- Turn the screen off between slides if the teacher are going to talk for more than two.
- Talk to the audience, not to the screen

Purposes

- To develop concepts and sequences in a subject matter area.
- To make marginal notes on the transparencies for the use of the teacher that can carry with out exposing them to the class.
- To test students performances, while other classmates observe.
- To show relationships by means of transparent overlays in contrasting color.
- To give the illusion of motion in the transparency.

Advantages

- It permits the teacher to stand in front of the class while using the projector, thus enabling her to point out features appearing on the screen by pointing to the materials at the projector it self and at the same time, to observe the students reactions to her discussion.
- Gains attention of the student

Over head transperencies

Transparencies are popular instructional medium. They are simple to prepare and easy to prepare and easy to operate with the over head projector which is light weight. A 10*10 inches sheet with printed, written or drawn material is placed on the platform of the projector and a large image is projected on a screen behind you. The projector is used from near to the front of the room with the teacher standing or sitting beside, facing the student.

Guidelines for making effective transparencies:

- Have one main idea an each transparency.
- Include only related figures and diagrams.
- Use simple lettering style in writing.
- Use diagrams in proposition to its lettering.
- Keep the message clear and simple.
- Emphasize the key messages.
- Use color and lettering with discretion.

Advantages

- Permits face to face interaction with the students.
- Can be used in daylight conditions.
- Can present information in systemic developmental sequences.
- Requires limited planning and can be prepared in variety of inexpensive methods.
- Easily available.

The opaque projector

Opaque projector is the only projector on which the teacher can project a variety of materials ex: - book pages, objects, coins, postcards,

or any other similar flat material that is non-transparent. The opaque projector will project and simultaneously enlarge, directly from the originals, printed matter, all kinds of written or pictorial matter in any sequence derived by the teacher. It requires a dark room, as projector is large and not reality movables.

Advantages

- Stimulates attention and arouses interest.
- Can project a wide range of materials like stamps, coins, specimen, when one copy is available.
- Can be used for enlarging drawings, pictures and maps.
- Does not require any written or typed materials, hand-written material can be used.
- Helps students to retain knowledge for longer period.
- Review instructional problems.
- Test knowledge and ability.
- Simple operation.

Disadvantages

- Costly equipment.
- Needs to use it with care.
- Needs a dark room for projectio

Slide projector

A slide is a small piece of transparent material on which a single pictorial image or scene or graphic image has been photographed or reproduced otherwise. Slides are a form of projected media that are easy to prepare. They are still pictures on positive film which the teacher can process and mount individually yourself or send to a film laboratory. The standard size of the slides is 2 “X 2 “any 35mm camera will make satisfactory slides.

Types of slides

1. Photographic slides: 2” X 2” 3” X 4”
   (a) Black and white
   (b) Colored

2. Hand made slides: can be made with
   (a) Acetate sheet
   (b) Cellophane
   (c) Etched glass
   (d) Plain glass
   (e) Lumarith

Slides can be made from photographs and pictures by teachers and pupils taking photographs and snapshots when they go on fieldtrips for historical, geographical, literacy or scientific excursions. The arrangement of slides in proper sequence, according to the topic discussed, is an important aspect of teaching with them.

Advantages

- Requires only filming, processing and mounting by self or laboratory.
- Results in colorful, realistic, reproduction original subject.
- Preparation with any 35mm camera for most uses.
- Easy to revise and up-date.
- Easily handled, stored and re-arranged for various uses.
- Can be combined with tape narration or can control time for discussion.
- May be adapted to group or individual use

Filmstrips

Film strips are sequence of transparent still pictures with individual frames on 35mm film. A tap recorded narration can be synchronized with film strip. Each strip contains from 12 to 18 or more pictures. It is a fixed sequence of related stills on a roll of 35mm film or 8mm film.

Principles

- Preview filmstrips before using them and selected carefully to meet the needs of the topic to be taught.
- Show again any part of the filmstrip needing more specific study.
- Use filmstrip to stimulate emotions, build attitudes and to point up problems.

- It should be introduced appropriately and its relationship to the topic of the study brought out.
- Use a pointer to direct attention, to specific details on the screen.

Types of filmstrip:

1. Discussion filmstrip: it is continuous strip of film consisting of individual frames arranged in sequence usually with explanatory titles.
2. Sound slide film: it is similar to filmstrip but instead of explanatory titles or spoken discussion recorded explanation is audible, which is synchronized with the pictures.

   Advantages:

- Are compact, easily handled and always in proper sequence.
- Can be supplemented with recordings.
- Are inexpensive when quantity reproduction is required.
- Are useful for group or individual study at projection rate are controlled by instructor or user.
- Are projected with simple light weight equipment.

1.2.2 Non projected audio visual aids

Graphic aids

It is a combination of graphic and pictorial material designed for the orderly and logical visualizing of relationships between key facts and ideas ex: comparisons, relative amounts developments, processes, classification or organization. It includes the following

Charts

These visual symbols used for summarizing, comparing, contrasting or performing other services in explaining subject matter. A chart is a combination of pictorial, graphic, numerical or vertical material, which presents a clear summary.

Purposes

- To visualize an item, it is otherwise difficult to explain only in words.
- To highlight important points.

- To provide outline for materials covered in presentation.
- To show continuity in process.
- For creating problems and stimulating thinking.
- For showing development of structure.

Types of charts

- Narrative chart: Arrangement of facts and ideas for expressing the events in the process or development of a significant issue to its point of resolution or the teacher can show an improvement over a period of years.
- The cause and effective chart: Arrangement of facts and ideas for expressing the relationship between rights and responsibilities or between a complex of conditions and change or conflict.
- The chain chart: arrangement of facts and ideas for expressing transitions or cycles.
- The evolution chart: facts and ideas for expressing changes in specific items from beginning data and its projections in to future.
- Strip tease chart: it enables speaker to present the information step by

It increases the interest and imagination of the audience.The information on the chart is covered with thin paper strips to which it has been applied either by wax, tape or sticky substance or pins. As the speaker wishes to visually reinforce a point with words or symbols, the student removes the appropriate strip or paper. It produces interest. It increases learning and aids recall.

- Pull chart: it consists of written messages which are hidden by strips of thick paper. The message can be shown to the viewer, one after another by6 pulling out the concealing strips.
- Flow chart: diagrams used to show organizational elements or administrative or functional relationships. In this chart lines, rectangles, circles, are connected by lines showing the directional flow.
- Tabulation chart: it shows the schedule of an activity or of an individual ex: time-table of a class. These are very valuable aid in the teaching situation where breakdown of a fact or a statement is to

be listed. Also it is a useful aid for showing points of comparison, distinction, and contrasts between two or more things. While making the table charts the following points must be kept in the mind.

The chart should be 50 X 75 cm or more in size.

The chart should be captioned in bold letters.

The vertical columns should be filled in short phrases rather than complete sentences.

- Flip chart: a set of charts related to specific topic have been tagged together and hang on a supporting stand. The individual charts will carry a series of related materials or messages in sequence. The silent points of specific topic will be presented.
- Pie chart: a circle will be drawn and divisions will be made into different sections, each section will be coded differently and code key will be given at right corner of the chart as legend. The circumference is divided into suitable sections. It is relevant for showing the component part

Flash cards

Flash cards are a set of pictured paper cards of varying sizes that are flashed one by one in a logical sequence.

Flash cards can be self made or commercially prepared and are made up of chart or drawing paper, plane paper using colors or ink on them for drawings.

Purposes

1. To teach the students.
2. To give health education.
3. Useful for small group.
4. Used in group discussions.

Principles

- The messages can be brief, simple line drawing or photographs, cartoons and the content will be written in few lines at the back of the each card.
- 10” X 12” or 22” X 28” is commonly used size.

- 10-12 cards for one talk can be used. It should not be less than 3 and more than 20.
- Prepare a picture for each idea which will give visual impact to the idea.
- The height of writing on the flash card is to be approximately 5cm for better visualization.

Using the flashcards

For class room instruction, the flash card s is to be properly used. The following steps are used while displaying flash cards.

- Give brief introduction about the lesson to students.
- Give instructions to students about their actions while the teacher flash the cards.
- Flash the card in front of the class by holding it high with both your hands so that all the students can see it.
- Let the student respond as per instructions already given.
- Review the lesson by selectively using flash cards.

Advantages

- Flash cards can be used to introduce and present topics.
- It can be used to apply information already gained by students to new situations
- It can be used to review a topic.
- Can be used for drill and practice in elementary classes
- To develop the cognitive abilities of recognition and recall of students.
- It can work as a useful supplementary aid and can be effectively used with other material.

Disadvantages

- Can not be used for a large group
- Prone to get spoiled soon
- Preparation is time consuming.

Posters

Posters are the graphic aids with short quick and typical messages with attention capturing paintings.

Purposes

- To provide general motivation.
- To create an esthetic or atmospheric effect.
- To communicate a more general idea. To thrust the message for leading to action.
- For the class room and community.
  Preparation and rules:
- To do a special job.
- To promote one point.
- To support local demonstration.
- Planned for specified people
- Tell the message at single glance.
- Use bold letters.
- Use pleasing colors...
- It should place, where people pass or gather.
  Features of a good poster:
- Brevity: message should be concise
- Simplicity: message should be easily understandable
- Idea: should base on single idea and it should be relevant.
- Color: suitable color and combination should be used to make the poster attractive and eye catching.
- Display: while displaying one should be sure to find a place where there is ad4equate light and where the larger population will see it.

Advantages

- It attracts attention.
- It conveys the message very quickly.
- It does not require a detailed study.
- Good poster leads to action with good motivation

- It can stand alone and is self explanatory.
  Disadvantages:
- Poster does not always give enough information
- When a poster is seen for longer time it may not attractive. So it should be dynamic

Graphs

Graphs are the visual teaching aids for presenting statistical data and contrasting the trends or changes of certain attributes.

Method of preparation:

- Before making the bar chart makes a rough sketch of it in a note book.
- For drawing the bar graph use the chart paper of 50x 72 cm size.
- Use two different color shades for the two contrasting groups.
- The bars should be equi-spaced.
- Write the key to the bar graph in a box on the right hand side corner of the chart paper.
- Numbers specifying the magnitude of the bars should be on the top on the bars.

Types

Pie graph: These are called as circle diagram. The data are presented thorough the sections of portions of a circle.

- In determining the circumference of a circle the teacher have to take in to consideration a quantity known as pie.
- The surface area of a circle is to cover 360 degree.
- The total frequencies or value us equated to 360 degree and then the angles corresponding to component parts are calculated.
- After determining their angle, the required sectors in the circle are drawn.

Bar graph: The graphic presentation extends the scale horizontally along the length of bars. Each bar must be of the same width, height of the bar over a period represents the corresponding time of the variable. Graphs are available in 2 forms that is vertical and horizontal

Line graph: To show the trends and relationships ex: single line shows the relation and the variation in the quantity. Quantitative data are plotted or when the data is continuous. The concepts are represented with the help of lines drawn either horizontally or vertically. The plotted points are connected to one another, instead of the base thus producing the curve.

Pictorial graph: It is an out standing method of graphic representation. Pictures are used for the expression of ideal; they are more attractive and easily understood. Vivid pictures will be used to create rapid association with the graphic message; each visual symbol may be used to indicate quantity.

Maps

A map is a graphic aid representing the proportionately as a diagram, the surface of the earth, world or parts there of. It conveys the message by lines, symbols, words and colors.

Types of maps:

- Political maps: these maps show political divisions of the world, a continent, a nation.
- Physical maps: shows the physical contour of a place, area, and region.
- Relief maps: it shows the actual elevations and depressions in a place, area, and region.
- Weather maps: shows the amount of rains, temperature extremes, humidity in an area, region country.
- Population maps: shows the distribution of population in various parts of region, country.
- Picture or tourist maps: shows historical spots monumental sites. etc..
- Road maps: shows the roads of a region connecting various parts and points together.
- Railway maps: shows the railway links between various points.
- Air maps: shows the air routes between various points.
- Sea root maps: shows the sea routes between various sea ports

Cartoons

The word cartoon has various meanings, based on several very different forms of visual art and illustration. The term has evolved over time. The original meaning was in fine art, and there cartoon meant a preparatory drawing for a piece of art such as a painting. A cartoon is humorous caricature which gives a subtle message. In a cartoon the features of objects and people are exaggerated along with generally recognized symbols.

Principles

- The quality of the drawing should be high primarily for visual effectiveness.
- The symbols used should be familiar and represent a concept or idea to which students can react intellectually.
  Advantages:
  A cartoon can be effectively used to initiate certain lesson.
- It can be used for making a lesson lively and interesting.
- Fantasy
- Satire
- Exaggeration.

News papers

It can furnish health messages in local languages which cancan reach to the public easily. The information will be available in low cost, easy to read and understand simple language. the people may learn to read and interpret the contents along with pictures to enhance easy grasping.

Advantages

- Best method to reach a large group
- Pictures will help in easy understanding
- Attractive and easy to understand
- Lot of information can be obtained in various fields
  Disadvantages
- useful for literates only
- detailed information cannot be produces

Comic strips

A comic strip is the graphic depiction in a series of pictures or sketches of some character and events full of action. This medium of communication is found very interesting and exciting by children.

Uses:

- Comic strips fire the imagination of children
- It boosts the courage of children and builds up the spirit of adventure.
- It communication detailed and vivid.
- It stimulates reality and involvement.
  Limitations:
- Comic strips misguide children by depicting characters with supernatural powers divorced from the hard realities of life.
- Comic strips hamper the development of language of children.
- Classics brought out in the form of comics develop the tendency in children to ignore or by pas s the original work.
- Comics can soon become an obsession with young children and they tend to avoid serious studies

1.3 DIMENTIONAL AIDS

Models

Definition: a model is a recognizable representation of a real thing three dimensionally, that is height, width, and depth is felt as reality.

Types of models:

- Solid models: it is the replica of an original thing made with some suitable material like clay, plaster of Paris, wood, iron etc. to show the external parts of the things. Ex: globe, clay model of human and animal.
- Cutaway and x-ray models: are the replicas of the original things to show internal parts of a thing. Cross sectional models are difficult to make in the class room or institutions as they require expertise to construct them. Ex: cross sectional model of human body.
- Working models: these models are either actual working things or their miniature replicas. For illustrating an operation. Ex: a motor, a generator.

- Sand models: made by using sand, clay, saw dust, ex: a tribal village, a forest area.

  Advantages:
- Models heighten reality of things and make learning direct and meaningful as they are three dimensional.
- Models illustrate the application side of certain principles and laws.
- Models explain the complex and intricate operations in a simplified way and thus make comprehension easier.
- Models are lasting and ultimately work out to be cheaper teaching aids.
- Still models are easy to make with the help of discarded materials like empty boxes, pins, clips, nails, and clay.
- Models are to reasonable size and convenient to handle.
- Models involve the use of all the five senses and thus make learning effective.

  Limitations:
- It requires expertise to make.
- Time consuming.
- Some of the models may be very expensive.

Objects and specimens

A collection of real things for instructional use refers to objects. A specimen is a sample of the real object or a material. Using objects and specimens: while using the specimen and objects as teaching aids, a teacher must keep the following points in her mind.

- Plan your teaching with certain simple and direct observations of the object or specimen being referred to.
- Ask questions from the students to elicit more details of the features of the object or specimen under observation.
- Clarify and emphasize important structural details of the object or specimen under observation
- Provide review and practice to make learning permanent.

Sources of objects and specimens:

- Local markets
- Manufacturers and factories
- Discarded material from the houses
- Specimen found in the nature can be collected by students from field trips and nature hunt
- Plasters casts can be purchased
- Wild flowers, leaves shells, stones butterflies moths, insects can also be procured.

Mounting the objects and specimens

Objects and specimens should be mounted in shallow boxes in an artistic way and the boxes should be covered with cellophane paper. Also label each object or specimen using self adhesive paper.

Advantages of objects and specimens:

- Collection of objects and specimens by students requires interaction with others leading to development of social skills and values.
- Students when collect and display objects and specimens derive satisfaction of contributing to the school and teacher something worthwhile.
- Student's power of observation and first hand experiences is enhanced by collection of objects and specimens.
- Student's personal collection of objects and specimens can be good source of doing investigatory projects.
- Collection of objects and specimens become an interesting educational pursuit of the teacher and students alike.
- It arouse some interest among students in learning
- Objects and specimens involve all the five senses in the process of learning
- It heighten the reality in the class room
- It makes teaching lively.

Exhibitions

Many times in the school, a department of the school or a class put up their work for showing it to the people out side the school, and such a show called exhibitions. The pieces of work done by the students for an exhibition are called exhibits.

Requisites for exhibition:

- The exhibition should have a central theme with a few sub themes to focus attention to a particular concept
- The exhibits should be clean, labeled properly
- The concepts of contrast in color and size should be used for lying out the exhibitions
- The exhibits should be so placed so the most visitors, can see them
- The place and exhibits should be well lighted
- To capture attention and interest of visitors, both motion and sound should be utilized
- The exhibition should have some exhibits with operative mechanism such as switches, handles, to be operated by the visitors to observe some happenings.
- The exhibition should include lot of demonstrations as they involve deeply the students and the visitors
- The exhibition should be able to relate various subjects' areas to provide integrated learning.

Advantages:

- Exhibitions inspire the students to learn by doing things themselves and they get a sense of involvement
- Exhibitions give students a sense of accomplishment and achievement
- Exhibitions develop social skills of communication, cooperation, coordination
- Exhibitions foster better school community relations and make community members conscious about the school
- Exhibitions couple information with pleasure
- Exhibitions foster creativity among students.

Disadvantages:

- Requires thorough preparation
- Time consuming
- Require funds or budget.

Museums

A museum is a building displaying a collection of historical relics, antiques, curiosities, works of arts, works of science, literature and

other artifacts of general interest.Museums can be useful both for public education and specific class room instructions.

Setting up school museum:

- School should have enough space
- Take the help of students, collect old and new objects and articles
- Accept donations from various organizations who donates the articles
- Students can be guided to prepare the exhibits
- All the collected and prepared articles should be displayed and labeled
- A detailed report book should be maintained giving a brief description of each museum pieces
- The museum rooms should be well lighted
- It should be cleaned and maintained timely.

Dioramas

A diorama is a three dimensional arrangement of related objects, models, and cut outs to illustrate a central theme or concept. The objects and models are generally placed in a big box or show case with a glass covering and background printed with a shade or a scene. Ex: a harvest scene, a planting scene etc.

Advantages

- Provide a good opportunity to learn
- It gives the appearance of actual things which can not be brought to the class room
- Interesting and enhance creativity
- Live things also can shown in diorama ex: aquarium
- Provides students to do project works

Disadvantages: sometimes cost effective

- Needs expatriation for the preparation
- Require budget
- Sometimes it may misguide the student if is not the replica of actual thing.

Mock ups

It emphasizes the functional relationship between the device reality and its workability. Certain element of the original reality is emphasized

to make it more meaningful for the purpose of instruction. In common usage, a mockup is a scale model of a structure or device, usually used for teaching, demonstration, testing a design, etc. Mockups are also used in the Consumer goods industry, as part of the product development process, when the size, impression and/or artworks have to be tested and approved. Mockup is also a frequently used term when talking about an early layout or sketch of a Web site or GUI program. Ex: An artificial kidney to demonstrate dialysis.

Moulage

Mould can be made up of plastic material to stimulate some life in objects. ex: body which shows evidence of trauma, infection, disease, surgical intervention.

Image perspectives' moulage process

The basic material the teacher use to create our soft tissue injuries is very inexpensive; it costs only pennies per simulation. If someone walks off with a simulation it can be recreated in a matter of minutes! the teacher are not limited to mass-produced latex or plastic "one-size-fits-all injuries". the teacher determine the type, scope and Size of the injuries and create as many as the teacher wish, in whatever size the teacher need. Our simulations can be handled and bandaged, with care, as the teacher would a real injury. The simulations will not shift and/or be damaged. When bandages are removed, the injury simulation will remain intact. The simulations can be made liquid-proof, and with care - reusable!

Puppets

One of the old and popular arts in Indian villages is puppetry. Puppetry is an education cum entertaining aid in which puppets manipulated by the performer is a person termed as a characters in a story to be depicted. A puppet is a manipulative doll dressed as a character and the performer is a person termed as a puppeteer. A good puppeteer has to blend his art with dramatization to produce the desired effect. It is used as an effective teaching aid for languages and social sciences.

Types of puppets

- String or marionettes puppets:-Marionettes consist of puppets with hinged body parts which are controlled by nine strings produces required movements in the puppet. These puppets are mainly manipulated by professional puppeteers.
- Stick puppets: - stick puppet are the painted cutouts attached by sticks. The actions of these puppets are manipulated by the teacher and students by hiding behind a screen so that only puppets are visible to the audience or the class.
- Shadow puppets: - shadow puppets are silhouettes of cardboard which produce shadows on white screen. The motion of these silhouettes is manipulated by the teacher and students.
- Finger of hand puppet: - Hand puppets are round balls painted as heads with overflowing colorful costumes. These are worn on fingers which operate their movements. These are operated from below the stage.

Selection

In writing or selecting a puppet play, the age, background and tastes of the students should be taken in to consideration. A short puppet play is always preferable.

Advantages

1. Creates interest
2. Gives the knowledge in a brief period
3. Puppet is an effective method in teaching.
4. Motivate students
5. Easy to carry and operate

Disadvantages

1. Needs group cooperation and coordination
2. Requires skills in preparation and supply
3. Skills needed in presentation

Display boards

Chalk board

A chalkboard or blackboard is a reusable writing surface on which text or drawings are made with chalk or other erasable markers. Blackboards were originally made of smooth, thin sheets of black or dark grey slate stone. Modern versions are often green or brown

and are thus sometimes called a greenboard or brownboard instead. A blackboard can simply be a piece of board painted with matte dark paint (usually black or dark green). A more modern variation consists of a coiled sheet of plastic drawn across two parallel rollers, which can be scrolled to create additional writing space while saving what has been written. The highest grade chalkboards are made of a rougher version porcelain enameled steel (black, green, blue or sometimes other colours). Porcelain is very hard wearing and chalkboards made of porcelain usually last 10-20 years in intensive use.

Blackboards have disadvantages:

- They produce a fair amount of dust, depending on the quality of chalk used.
- Some people find this uncomfortable or may be allergic to it, and there has been speculation about links between chalk dust and respiratory problems.
- The dust also precludes the use of chalk in areas shared with dust-sensitive equipment such as computers. However, these alternative methods of displaying information have drawbacks of their own.
- The scratching of fingernails on a blackboard is a sound that is well-known for being extremely irritating.
- Blackboards are also used in many establishments (typically public houses) as a form of advertising often for upcoming events and menus - as well as to keep the score in darts matches

Flannel board

Sometimes called a flannel graph. This teaching tool is called by different names: Visual Board, Frick Board, Slap Board, Felt Board, Coherograph, Video graph

Flannelgraph is a storytelling system that uses a board covered with flannel fabric, usually resting on an easel. It is very similar to Fuzzy felt, although its primary use is as a storytelling medium, rather than as a toy

How to use

The principle involved is the inter1ooking of fibers of two rough or bairy surfaces, so that the pieces pressed on to a background which is hard and vertical will stay. It can be illustrated on a larger scale

by pressing two tooth brushes or hair brushes together, so the bristle inter-1ook. In case of flannel graph similar principle of friction helps an object to cling to the surface of the board.

The flannel board is usually painted to depict a background scene appropriate to the story being told. Paper cutouts of characters and objects in the story are then placeon the board, and moved around, as the story unfolds. These cutouts are backed, either with flannel, or with some other substance that adheres lightly to the flannelbackground, such as coarse sandpaper.

Advantages

1. Permits numerous and varied arrangements of visua1 materials.
2. Permits the use of either chart or small pieces of material Materials can be packed and transported complete notes. 3) Permits the development of a complete story.
3. Promotes conscientious planning, which must precede the development of the material in the first place.
4. Challenges one to develop symbols to portray such things as abstractions.
5. Easier to construct materials for flannel board than to make slides or movies.

Disadvantages

1. Transportation and storing of boards and materials is a problem. Suitable tables to support boards must be available.
2. Time and cost of making material for presentation present a problem.
3. Cost of boards themselves can’t be overlooked.
4. Presentation is limited a new idea involves a lapse of time before the new material can be added
5. Might tend to deter one from using other more effective methods and techniques when it is evident that other methods might be more appropriate.
6. To tell a complete story it often takes either too much board space or smaller designs and materials some of which cannot be seen well.

Bulletin board

It is a soft board which will hold pins or tags almost suitable. Simple device placed either indoor or outdoor. Items generally displayed are photographs, publications, posters, news paper cut outs.

Advantages

- Explains important eventsReports special activities
- Disadvantages
- Not effective for illiterate group.
- Takes lot of preplanning and preparation

A bulletin board (pinboard, pin board or notice board in British English) is a place where people can leave public messages, for example, to advertise things to buy or sell, announce events or provide information. Dormitory corridors, well-trafficked hallways, lobbies, and freestanding kiosks often have cork boards attached to facilitate the posting of notices. At some universities, lampposts, bollards, trees, and walls often become impromptu postering sites in areas where official boards are sparse in number.

Peg board

It is a type of board which contains small holes to fix certain letters into the holes which is used especially in the offices to display certain items, name of the personal or faculty member.

Magnetic boards

It is a framed iron sheet carrying porcelain coating in some dark color generally black or green. It can be used to display pictures, cutouts and light objects with disc magnets or magnetic holders.

Advantages

- Movement of visual material is easy.

Auditory aids

These are also an effective aid, usually radios, recorders, gram phones come under this category.

Using a record player for teaching:

- A record player can be used in the following ways in the actual class room situation

- A record player can be used to supplement a lesson.
- A record player can be used for an appreciation lesson in music.
- A record player can be used for an appreciation lesson in literature.
- A record player can be used for students to acquire the singing ability, deliver a speech properly, and recite a poem in the right way.
- The player can be used to end or conclude a lesson;
- Introduce a lesson and review a lesson.
- A record player can be used for physical exercises accompanied with music

Tape recorder

A tape recorder is a portable electronic gadget to record, reproduce, erase and re record sound on a magnetic tape. This device can be used without much fuss by any body by operating the following press buttons attached to the recorder, viz, stop, play, wind, rewind, record, pause, and eject.

Uses: it is used to learn foreign languages, rhymes, and songs with clarity. GRAME PHONES Like radio gramophones are also important teaching devices. Helps to listen to famous speeches.

Activity aids

There are certain learning situations in which student participation through direct experiences can be easily incorporated, these are called activity aids. The activity teaching aids are really of great value as they put students in a role of active seekers of knowledge. There are five important activity teaching aids, which are listed below:-

1. Field trips
2. Demonstrations
3. Experiments
4. Dramatizations

Field trips

According to Hedger ken Field trip may be defined as "an educational procedure by which the student studies firsthand objects and materials in their natural environment."

Types of field trips: -

Depending on the place of visit and its duration, field trips are mainly of the following four types, namely:-

(*a*) Local school trips

(*b*) Community trip

(*c*) Educational trips

(*d*) The natural hunt

Advantages of field trip:

Field trip provides learning experience in the real life situation by direct contact with objects, process, and systems and thus has many advantages which are enumerated as follows:

- It provides accurate information objects, process, and systems in their real life setting.
- It provides meaningful direct experience and hence results in lasting learning.
- The students learning can be easily diverted towards effective learning.
- Field trips are valuable aids to what students are curious about the natural and man-made process and objects.
- Field trips can effectively supplement the classroom learning through application and reviewing the experiences of student.

Limitations of field trip:

- A field trip may be occasional activity which at best supplement some learning segments of the syllabus.
- They can be expensive and out of reach for many disadvantaged and poor students.
- Field trips require proper and detailed planning to make them meaningful otherwise the trip leads to confusion, and fails to fulfill the requirement

Demonstrations

Demonstration method is a concrete visual aid, because of its wide use in the teaching of nurses. In nursing education, it is used for this purpose and also for clinics, conferences, laboratory classes, symposia, autopsies, and teaching of health to patients. The demonstration method

teaches by explanation and exhibition. In short, it is a performance to show a process or activity to others. When a teacher demonstrates, students observe and imitate to learn

Advantages of demonstration:-

The following are the advantages of demonstration method.

1. It activates several senses. This increases learning, because it gives a better opportunity for observational learning.
2. It clarifies the underlying principles by demonstrating the 'why' or 'how' of the procedure.
3. It provokes interest by use of concrete illustrations.
4. It correlates theory with practice engages student's attention and concentration.
5. It encourages student's participation in learning through questions and answers as the teacher performs.

Experiment

An experiment is a learning activity in which students collect and interpret observations using measuring instruments to reach some conclusions. In science subjects experiments are used invariably used as instructional aid as they encourage learning by doing. While giving a lesson on an experiment, the teacher should organize the instruction so as to make the students aware of the following steps of the experiments:

1. Objectives of the experiments
2. Apparatus required
3. Procedure or methodology
4. Observations of data
5. Computation (totaling) of the observations made.
6. Results or conclusion
7. Precautions
8. Ideas for future work

The student performs the experiment and writes a report on it. Showing the cause and effect relationship.

Dramatization

Dramatization is a very potent method of keeping the class room instruction lively and interesting. When a teacher dramatizes a lesson, the students become both the spectators and participants. This makes learning easy and permanents.

Types of dramatizations suitable for class room instruction:-

1. Role-play
2. Play lets
3. Pageant
4. Pantomime
5. Tableaux

Advantages of dramatization:

1. Dramatization gives an added advantage of students working as both observers (spectators) and doers (participants) unlike in experiment where there are just doers and in demonstration where there are just observers.
2. Dramatization makes learning a pleasure children love to act and show off.
3. Dramatization involves students totally and they appreciate the lessons remember it better
4. Dramatization develops the social skills required for them such as cooperation, co-ordination, punctuality, and human relations etc.
5. Dramatization makes students creative, sensitive, and alert.

1.4. INDIVIDUALIZED INSTRUCTION: KELLAR PLAN, PSI,CAI, CMI &PLM

1.4.1 Personalized System of Instruction

Introduced in 1964 by Fred Keller, the Personalized System of Instruction, or the Keller Plan, is perhaps one of the first comprehensive systems of individualized instruction. Keller based his system on ten accepted educational principles (McGaw, p. 4):

1. Active responding
2. Positive conditions and consequences
3. Specification of objectives

4. Organization of material
5. Mastery before advancement
6. Evaluation/objectives congruence
7. Frequent evaluation
8. Immediate feedback
9. Self-pacing
10. Personalization

None of these ten principles should be considered unique, as they all can be easily found in other more traditional educational settings. Rather, it is the components of the Keller plan–based on these ten principles–that makes the Keller Plan somewhat different: self-pacing; unit mastery; student tutors; optional motivational lectures; and learning from written material. It is the first component, self-pacing, that is the most obvious attempt at individualizing the instruction. From the second component, unit mastery, it can be seen that the content does not vary, as the unit content is fixed. To illustrate the static nature of the content, Mike Naumes describes the basic design of a course using Keller's personalized system of instruction:

Breaking the material of the course into several units…. dividing the material intounits one to two weeks long…. [and] aseach unit of material is covered, specific learning objectives are given to the students. These state exactly what a student must know to pass a unit quiz.

The last three components indicate that the method of instruction does vary slightly from individual to individual. Although all students learn from written material and student tutors, the motivational lectures are optional. Making these lectures optional does constitute some flexibility in terms of instructional method, albeit extremely limited. Fundamentally, it is the self-pacing that more or less stands alone as the individualized component of this instructional system.

Proponents of the Keller Plan cite many benefits, including better retention and increased motivation for further learning. At the same time, there are others with criticisms of the Keller Plan such as the following: limited instructional methods, high dropout rates, and decreased human interaction. The debate over the effectiveness of Keller's Personalized System of Instruction, with its advantages and disadvantages, raises fundamental questions about the nature of self-contained, self-paced learning. There are indeed opportunities for designing instruction that

lend themselves to the Personalized System of Instruction approach. This would apply especially to cases where enrollment is high, course material is standardized and stable, and faculty resources are scarce. On the other hand, when there is not a shortage of faculty, or the class size is not large, the course would be better taught with more conventional methods, yet still based on sound educational principles. Where the line is drawn on the continuum between these two extremes is a matter of opinion, and should be based on the context in which the instruction is to take place. It would be inappropriate to claim that one of the extremes is completely right, and the other wrong, given the vast number of studies and evaluations that support either side.

Audio-Tutorial. Audio-Tutorial is a method of individualized instruction developed by Samuel N. Postlethwait in 1961 at Purdue University. His goal was to find an improved method of teaching botany to a larger number of college students and to effectively assist the students who possessed only limited backgrounds in the subject. The development of an Audio-Tutorial program requires a significant amount of planning and time by the instructor. Although there is some room for modification for each specific program, the general principles remain the same. Students have access to a taped presentation of a specifically designed program that directs their activities one at a time. The basic principles of Audio-Tutorial are "(1) repetition; (2) concentration; (3) association; (4) unit steps; (5) use of the communication vehicle appropriate to the objective;(6) use of multiplicity of approaches; and (7) use of an integrated experience approach" (Couch, p. 6).

The major benefits of Audio-Tutorial are that "students can adopt the study pace to their ability to assimilate the information. Exposure to difficult subjects is repeated as often as necessary for any particular student" (Postlethwait, Novak, and Murray, p. 5). In addition to taking more time if they wish, students can also accelerate the pace of their learning. Other benefits are that students feel more responsible for their learning, and more students can be accommodated in less laboratory space and with less staff.

Some of the major criticisms that are common to Audio-Tutorial courses were illustrated by Robert K. Snortland upon evaluating a course in graphics design. The primary criticism concerns the claim of responsibility. It seems that some students respond to the responsibility placed upon them, while others do not. There was a problem with

the initial dropout rate, which seemed to be explained by the lack of willingness of some students to take on the amount of responsibility that was required in order to complete the course. Snortland advised that "since many freshmen students are not ready for additional self-discipline required of them in the A-T format, the choice of either a structured approach or an individualized approach should always remain open" (p. 8). Many other criticisms of Audio-Tutorial courses are concerned with teacher control. The instructor dictates all of the material including the learning and feedback procedures. The criticism is that this is a severe form of teacher control over the student.

1.4.2 Computer Assisted Instruction (CAI)

Computer-Assisted Instruction (CAI). Most proponents of individualized instruction saw the computer as a way to further improve the design and delivery of individualized instruction–now in an electronic environment. With the advent of the computer came the potential to deliver individualized instruction in a more powerful way. This potential was anticipated long before the proliferation of the home computer. John E. Coulson wrote in 1970: "A modern computer has characteristics that closely parallel those needed in any educational system that wishes to provide highly individualized instruction"(p. 4). the student also noted the specific benefits that the computer could offer (p. 5):

1. "It has a very large memory capacity that can be used to store instructional content material or…to generate such material."
2. "The computer can perform complex analyses of student responses."
3. "The computer can make decisions based on the assessments of student performance, matching resources to individual student needs."

Although there were many anticipated benefits to using the computer to deliver instruction, in practice, CAI has been heavily criticized for its hidden side-effects. These are nicely articulated by Henry F. Olds:

Learning is in control of some unknown source that determines almost all aspects of the interactive process. To learn one must suspend all normal forms of interaction and engage only in those called for by the program. Learning is an isolated activity to be carried on primarily in a one-to-one interaction with the computer. Normal inter-human dialogue is to be suspended while learning with the computer. Learning involves

understanding (psyching out) how the program expects one to behave and adapting one's behavior accordingly. One must suspend idiosyncratic behavior. Learning (even in highly sophisticated, branching programs) is a linear, step-by-step process. In learning from the computer, one must suspend creative insights, intuitions, cognitive leaps, and other nonlinear mental phenomena. Olds even offered some solutions to these problems, indicating that "time on-line needs to be mixed with plenty of opportunities for human interaction" and that computer should allow people to "jump around within the program structure".

CAI became the forerunner in individualized instruction during the 1980s and early 1990s, as the home computer became more powerful and less expensive. The changes that the computer environment helped to make were predominantly a change in the delivery mechanism of individualized instruction, rather than a fundamental change in purpose or method. In a sense, the computer, especially the home computer, offered a convenience that other delivery mechanisms lacked. This convenience was accelerated with the proliferation of the Internet in late 1990s. Starting as an extension of computer-based instruction, online education became increasingly popular and eventually began to supplant CAI as the predominant form of individualized instruction.

1.4.3 Computer Managed Instruction (CMI)

The CMI module manages the learning process. It comprises teacher - student - interaction and interaction between computer and other teaching tools. CMI manages each student through the material which was designed by the teacher and shows the student's progress.

- CMI implementation can reduce instructor work loads by automating tedious and routine functions such as grading, scheduling, and keeping track of resources.
- CMI can be introduced in phases and adapted to meet the needs and concerns of any particular instructor or group of instructors.
- CMI can be done with just one computer.
- CMI provides an excellent way to organize and integrate both CBI and traditional (off-line) instructional materials.
- CMI helps instructors and curriculum planners determine curriculum needs.
- CMI may be used for either individualized or group instruction.

- CMI provides a basis for evaluation of both students and instruction.
- CMI can solve some problems posed by incompatible software and hardware.

CMI is used for

- Input and storage of student data (primarily test scores and activities completed)
- Input and storage of curricular data (generally objectives, test items linked to objectives, and instructional materials or activities linked to objectives)
- Retrieval and analysis of the data relating student scores and activity to the curriculum data
- Generation of various reports showing individual or group progress and current status

The extended of operant learning principles for CMI instructor role (Keller, 1966, 1968)

- Telling the student what they are expected to learn by a statement of course and unit objectives.
- Requiring restudy and repeated testing until the student achieve unit mastery.
- Criterion-referenced evaluation of accomplishments.
- Using student proctors as tutor to enhance the personal-social aspects of education.
- Using lectures and demonstrations as vehicles of motivation rather than as sources of critical information

The functions of the CMI instructor's role – from operant learning perspectives

- Counselling and advising students about appropriate strategies for attending to new information and for constructing meaning from it.
- Diagnosing internal sources of students' learning problems, including their use of appropriate cognitive process, learning strategies, motivational process, and self-statement.
- Decision-making about appropriate remediation activities, strategies, and resources that are matched to students' learning needs.

- Modelling the practical use of new information and skills and the concept of personal responsibility through individual and group tutorial sessions.
- Modifying, as necessary, students' inappropriate attributions and perceptions about locus of responsibility for learning.

PLATO (Programmed Logic for Automatic Teaching Operations)

PLATO (Programmed Logic for Automatic Teaching Operations) was the first generalized computer-assisted instructionsystem. Starting in 1960, it ran on the University of Illinois' ILLIAC I computer. By the late 1970s, it supported several thousand graphics terminals distributed worldwide, running on nearly a dozen different networked mainframe computers. Many modern concepts in multi-user computing were originally developed on PLATO, including forums, message boards, online testing, e-mail, chat rooms, picture languages, instant messaging, remote screen sharing, and multiplayer games.

PLATO was designed and built by the University of Illinois and functioned for four decades, offering coursework (elementary through university) to UIUC students, local schools, and other universities. Courses were taught in a range of subjects, including Latin, chemistry, education, music, and primary mathematics. The system included a number of features useful for pedagogy, including text overlaying graphics, contextual assessment of free-text answers, depending on the inclusion of keywords, and feedback designed to respond to alternative answers.

Rights to market PLATO as a commercial product were licensed by Control Data Corporation (CDC), the manufacturer on whose mainframe computers the PLATO IV system was built. CDC President William Norris planned to make PLATO a force in the computer world, but found that marketing the system was not as easy as hoped. PLATO nevertheless built a strong following in certain markets, and the last production PLATO system did not shut down until 2006, coincidentally just a month after Norris died.

Influences and Impacts

Educators and students used the PLATO System for music instruction at other educational institutions including Indiana University, Florida State University, and the University of Delaware. Many alumni of the

University of Illinois School of Music PLATO Project gained early hands-on experience in computing and media technologies and moved into influential positions in both education and the private sector.

The goal of this system was to provide tools for music educators to use in the development of instructional materials, which might possibly include music dictation drills, automatically graded keyboard performances, envelope and timbre ear-training, interactive examples or labs in musical acoustics, and composition and theory exercises with immediate feedback.[19] One ear-training application, Ottaviano, became a required part of certain undergraduate music theory courses at Florida State University in the early 1980's.

Another peripheral was the Votrax speech synthesizer, and a "say" instruction (with "saylang" instruction to choose the language) was added to the Tutor programming language to support text-to-speech synthesis using the Votrax.

A PLATO V terminal in 1981, displaying RankTrek application, one of the first to combine simultaneous local microprocessor-based computing with remote mainframe computing. The monochromatic plasma display's characteristic orange glow is illustrated. Infrared sensors mounted around the display watch for a user's touch screen input.

With the advent of microprocessor technology, new PLATO terminals were developed to be less expensive and more flexible than the PLATO IV terminals. At the University of Illinois, these were called PLATO V terminals, even though there never was a PLATO V system (the system continued to be called PLATO IV). The Intel 8080 microprocessors in these terminals made them capable of executing programs locally, much like today's Java applets and ActiveX controls, and allowed small software modules to be downloaded into the terminal to augment the PLATO courseware with rich animation and other sophisticated capabilities that were not available otherwise using a traditional terminal-based approach.[20]

Early in 1972, researchers from Xerox PARC were given a tour of the PLATO system at the University of Illinois. At this time, they were shown parts of the system, such as the Show Display application generator for pictures on PLATO (later translated into a graphics-draw program on the Xerox Star workstation), the Charset Editor for "painting" new characters (later translated into a "Doodle" program at PARC), and the Term Talk and Monitor Mode communications programs. Many of

the new technologies they saw were adopted and improved upon, when these researchers returned to Palo Alto, California. They subsequently transferred improved versions of this technology to Apple Inc..

By 1975, the PLATO System served almost 150 locations from a donated CDC Cyber 73, including not only the users of the PLATO III system, but a number of grammar schools, high schools, colleges and universities, and military installations. PLATO IV offered text, graphics and animation as intrinsic components of courseware content, and included a shared-memory construct ("common" variables) that allowed TUTOR programs to send data between various users. This latter construct was used both for chat-type programs, as well as the first multi-user flight simulator. With the introduction of PLATO IV, Bitzer declared general success, claiming that the goal of generalized computer instruction was now available to all. However, the terminals were very expensive (about $12,000), so as a generalized system, PLATO would likely have needed to be scaled down for cost reasons alone.

In the early 1970s, some people working in the modern foreign languages group at the University of Illinois began working on a set of Hebrew lessons, originally without good system support for leftward writing. In preparation for a PLATO demo in Teheran, that Bruce Sherwood would participate in, Sherwood worked with Don Lee to implement support for leftward writing, including Persian (Farsi), for which the writing system is based on that of Arabic. There was no funding for this work, which was undertaken only due to Sherwood's personal interest, and no curriculum development occurred for either Persian or Arabic. However, Peter Cole, Robert Lebowitz, and Robert Hart used the new system capabilities to re-do the Hebrew lessons. The PLATO hardware and software supported the design and use of one's own 8-by-16 characters, so most languages could be displayed on the graphics screen (including those written right-to-left).

1.5. ADVANCED TECHNIQUES IN EDUCATION:

1.5.1 Multimedia

Multimedia, is the combination of various digital media types such as text, images, audio and video, into an integrated multi-sensory interactive application or presentation to convey information to an audience. Traditional educational approaches have resulted in a mismatch between what is taught to the students and what the industry needs. As

such, many institutions are moving towards problem based learning as a solution to producing graduates who are creative; think critically and analytically, to solve problems. In this paper, the teacher focus on using multimedia technology as an innovative teaching and learning strategy in a problem-based learning environment by giving the students a multimedia project to train them in this skill set.

1.5.2 Interactive video

Interactive video is attractive to administrators for several reasons. IV provides access to education to those who live in remote locations and cannot travel to the university; it can provide access to at-risk or special needs students (Woodruff and Mosby, 1996); it enables large numbers of students to be taught simultaneously by one instructor; outside speakers can be involved who would not otherwise be available, and students can become linked with others from different communities, backgrounds and cultures (Willis, 1992.)

For the instructor, interactive video can be effective because it allows for "real time" or synchronous visual contact between students and the instructor or among students at different sites. Furthermore, it supports the use of diverse media (Reed & Woodruff, 1996.) Thus, many things common in the traditional classroom can be used in the interactive classroom, such as blackboards, documents, videos and transparencies.

Disadvantages

As with any technology, interactive video is not without limitations. IV is expensive, especially the initial cost. Since it involves sophisticated technology there can be audio and visual difficulties, which cannot be resolved by the professor (Galbreth, 1995.) While compressed video holds great promise for expanding the classroom, it also amplifies poor teaching styles and strategies. Instructors must devote greater than normal effort toward preparation and development of instructional strategies that actively encourage learning. Instructors typically spend more time initially preparing for the interactive class, paying special attention to the development and production of visual material (Woodruff & Mosby, 1996.) Additionally, the instructor must be vigilant in making sure the students remain involved in the course, a task more difficult when classes are taught at a distance.

Frequently instructors are given insufficient time and resources in which to prepare for the course and insufficient compensation for the development and delivery of the course. The planning process and learning curve may seem excessive at first, but the shift from "knowledge disseminator" to "learning facilitator" is likely to enhance learning for both local and remote students (Reed & Woodruff, 1996.)

1.5.3 Teleconferencing

Teleconferencing means meeting through a telecommunications medium. It is a generic term for linking people between two or more locations by electronics. There are at least six types of teleconferencing: audio, audiographic, computer, video, business television (BTV), and distance education. The methods used differ in the technology, but common factors contribute to the shared definition of teleconferencing:

- Use a telecommunications channel
- Link people at multiple locations
- Interactive to provide two-way communications
- Dynamic to require users' active participation

Interactive technologies

The new systems have varying degrees of interactivity - the capability to talk back to the user. They are enabling and satellites, computers, teletext, viewdata, cassettes, cable, and videodiscs all fit the same emerging pattern. They provide ways for individuals to step out of the mass audiences and take an active role in the process by which information is transmitted. The new technologies are de-massified so that a special message can be exchanged with each individual in a large audience. They are the opposite o mass media and shift control to the user.

Many are asynchronous and can send or receive a message at a time convenient for individuals without being in communication at the same time. This overcomes time as a variable affecting communication. A video, data and voice delivery system reduces travel costs. When the material is retrieved and saved to a video tape or disc, the material can be used at anytime or anyplace. As more interactive technologies emerge, the value of being an independent learner will increase. Research shows that learning from new technologies is as effective as traditional

methods. Large groups are cost-effective and everyone gets the same information.

Types of Teleconferences

Audio Teleconference: Voice-only; sometimes called conference calling. Interactively links people in remote locations via telephone lines. Audio bridges tie all lines together. Meetings can be conducted via audio conference. Preplanning is necessary which includes naming a chair, setting an agenda, and providing printed materials to participants ahead of time so that they can be reviewed. Distance learning can be conducted by audio conference. In fact, it is one of the most underutilized, yet cost effective methods available to education. Instructors should receive training on how to best utilize audio conferences to augment other forms of distance learning.

Audiographics Teleconference: Uses narrowband telecommunications channels to transmit visual information such as graphics, alpha-numerics, documents, and video pictures as an adjunct to voice communication. Other terms are desk-top computer conferencing and enhanced audio. Devices include electronic tablets/boards, freeze-frame video terminals, integrated graphics systems (as part of personal computers), Fax, remote-access microfiche and slide projectors, optical graphic scanners, and voice/data terminals.

Audiographics can be used for meetings and distance learning.

Computer Teleconference: Uses telephone lines to connect two or more computers and modems. Anything that can be done on a computer can be sent over the lines. It can be synchronous or asynchronous. An example of an asychronous mode is electronic mail. Using electronic mail (E-Mail), memos, reports, updates, newsletters can be sent to anyone on the local area network (LAN) or wide area network (WAN). Items generated on computer which are normally printed and then sent by facsimile can be sent by E-Mail.

Computer conferencing is an emerging area for distance education. Some institutions offer credit programs completely by computer. Students receive texts and workbooks via mail. Through common files assigned to a class which each student can assess, teachers upload syllabi, lectures, grades and remarks. Students download these files, compose their assignment and remarks off-line, then upload them to the common files. Students and instructors are usually required to log

on for a prescribed number of days during the week. Interaction is a large component of the students' grades. Through computers, faculty, students and administrators have easy access to one another as well as access to database resources provided through libraries. The academic resources of libraries and special resources can be accessed such as OCLC, ERIC, and Internet.Administrators can access student files, retrieve institutional information from central repositories such as district or system offices, government agencies, or communicate with one another. Other resources can be created such as updates on state or federal legislation.

Video Teleconference: Combines audio and video to provide voice communications and video images. Can be one-way video/two-way audio, or two-way video/two-way audio. It can display anything that can be captured by a TV camera. The advantage is the capability to display moving images. In two-way audio/video systems, a common application is to show people which creates a social presence that resembles face-to-face meetings and classes and enables participants to see the facial expressions and physical demeanor of participants at remote sites. Graphics are used to enhance understanding. There are three basic systems: freeze frame, compressed, and full-motion video.

Video conferencing is an effective way to use one teacher who teaches to a number of sites. It is very cost effective for classes which may have a small number of students enrolled at each site. In many cases, video conferencing enables the institution or a group of institutions to provide courses which would be canceled due to low enrollment or which could not be supported otherwise because of the cost of providing an instructor in an unusual subject area. Rural areas benefit particularly from classes provided through video conferencing when they work with a larger metropolitan institution that has full-time faculty. Through teleconferencing, institutions are able to serve all students equitably.

Why Use a Teleconference?

Videoconferencing increases efficiency and results in a more profitable use of limited resources. It is a very personal medium for human issues where face-to-face communications are necessary. When the teacher can see and hear the person the teacher are talking to on a television monitor, they respond as though the teacher were in the same room together. It is an effective alternative to travel which can easily add

up to weeks of non-productive time each year. With videoconferencing, the teacher never have to leave the office. Documents are available, and experts can be on hand. A crisis that might take on major proportions if the teacher are out of town, can be handled because you're on the job. Videoconferencing maximizes efficiency because it provides a way to meet with several groups in different locations, at the same time.

As the limited resource of funding has decreased, limited resources now include instructors, parking spaces and buildings. Students now include time as a limited resources. Teleconferencing enables institutions to share facilities and instructors which will increase our ability to serve students.

1.5.4 Teletext and videotex

Videotex (or "interactive videotex") was one of the earliest implementations of an end-user information system. From the late 1970s to early 2010s, it was used to deliver information (usually pages of text) to a user in computer-like format, typically to be displayed on a television or a dumb terminal.

In a strict definition, videotex is any system that provides interactive content and displays it on a video monitor such as a television, typically using modems to send data in both directions. A close relative is teletext, which sends data in one direction only, typically encoded in a television signal. All such systems are occasionally referred to as viewdata. Unlike the modern Internet, traditional videotex services were highly centralized. Videotex in its broader definition can be used to refer to any such service, including the Internet, bulletin board systems, online service providers, and even the arrival/departure displays at an airport. This usage is no longer common. With the exception of Minitel in France, videotex elsewhere never managed to attract any more than a very small percentage of the universal mass market once envisaged. By the end of the 1980s its use was essentially limited to a few niche applications.

Eletext (or **broadcast teletext**) is a television information retrieval service created in the United Kingdom in the early 1970s by the PhilipsLead Designer for VDUs, John Adams. Teletext is a means of sending pages of text and simple geometric shapes from mosaic blocks to a VBI decoder equipped television screen by use of a number of reserved vertical blanking interval lines that together form the dark band dividing pictures horizontally on the television screen.[1] It offers

a range of text-based information, typically including news, weather and TV schedules. Paged subtitle (or closed captioning) information is also transmitted within the television signal.

It is closely linked to the PAL broadcast system used in Europe. Other teletext systems have been developed to work with the SECAM and NTSC systems, but teletext failed to gain widespread acceptance in North America and other areas where NTSC is used. In contrast, teletext is nearly ubiquitous across Europe as well as some other regions, with most major broadcasters providing a teletext service. Common teletext services include TV schedules, regularly updated current affairs and sport news, simple games (such as quizzes) and subtitles (or closed captioning).

Teletext is broadcast in numbered "pages." For example, a list of news headlines might appear on page 110; a teletext user would type "110" into the TV's remote control to view this page. The broadcaster constantly sends out pages in sequence. There will typically be a delay of a few seconds from requesting the page and it being broadcast and displayed, the time being entirely dependent in the number of pages being broadcast. More sophisticated receivers use a buffer memory to store some or all of the teletext pages as they are broadcast, allowing instant display from the buffer.

This basic architecture separates from other digital information systems, such as the internet, whereby pages are 'requested' and then 'sent' to the user – a method not possible given the one-way nature of broadcast teletext. Unlike the Internet, teletext is broadcast, so it does not slow down further as the number of users increase, although the greater number of pages, the longer one is likely to wait for each to be found in the cycle. For this reason, some pages (e.g. common index pages) are broadcast more than once in each cycle.

It has proved to be a reliable text news service during events such as the September 11 terrorist attacks, during which the webpages of major news sites became inaccessible because of the high demand. Teletext is also used for carrying special packets interpreted by TVs and video recorders, containing information about channels, programming, etc. (see Later developments).

Although the term "teletext" tends to be used to refer to the PAL-based system, or variants, there.

Chapter-2

TECHNOLOGY IN LANGUAGE TEACHING

2.1 PRINCIPLES OF LANGUAGE TEACHING

1. **Starting with speaking, not writing**-In making the child learn a language, the student should be made to start with speaking, because language is primarily a spoken skill, writing and reading should come after learning speaking.
2. **Teaching the correct use of language**-The teacher should teach the-correct use of language and not its linguistic history.
3. **Teaching language of everyday use**-Emphasis should be laid on teaching language of everyday use and not the language of literacy, color and poetic imagination: The child should be taught to express his ideas in the simplest manner
4. **Teaching spoken language and not vocabulary**-The child should be taught how to learn spoken language and use it for conveying his thoughts in a clear way. the student should not be
5. **Principles of teaching English as a foreign language**:

   Mother tongue is always learnt easily because there. is natural environment around. But this is not true about a foreign language. The child learns this language 41 his English classes held four or six periods a week. Therefore, it becomes difficult for him to learn the language.

   Hence, a natural environment would be proceeded by-

   (i) Talking to students in the target language in the class, playground etc.,

   (ii) Arranging group discussions.

6. **Principles of exposure-**The child learn the mother tongue more rapidly because the student is more exposed to the environment, where this language is spoken or written. Hence, the teacher should try to **expose students** to an environment loaded with the foreign language.
7. **Principles of habit formation**-"Language is essentially a habit forming process, a process during which the teacher acquire new habits."

An attempt should be made to form habits in the students for learning a language by the following process-

1 Habit of listening to and distinguishing between sounds.
2 Habit of speaking with proper intonation and accent.
3 Habit of reading **newspapers**, magazines, story books, etc.
4 Habit of silent reading.
5 Habit of going to library.
6. Habit of reading aloud with exact articulation.
7. Habit of consulting a dictionary.
8. Habit of using correct grammar.
9. Habit of imitation.
10. Habit of spelling.
11. Habit of using words in their proper contexts.
12. Habit of repeating.
13. Habit of correct pronunciation.

8. **Teaching the language and not its literature**-The child should be taught the simple use of language instead of introducing him to the realms of literature.
9. **Stress on practice and exercises**-Language learning is acquired by practice and habit formation. So, great stress should be laid on practice instead of cramming exercises.
10. **Proceed from the concrete to the abstract**-The teacher must begin his lesson with concrete things. the student must talk about things and not about words. the student must talk about the normal actions and even give a demonstration and must. The action is concrete in the pedagogic sense and the name 'abstract' and by performing an action and giving the word which expresses it, the student is proceeding from the concrete to the abstract.

11. **Make all lessons interesting and attractive**-This principle is as important for the teaching of English as for any other subject. In the earlier stages, lessons can be made interesting and attractive. Wren says, "by **utilizing objects** and pictures interesting to the class, as subjects conversation, by allowing all boys to do something as well as to say something, by giving fullest play, within the limits of good discipline of the childish instinct for activity change and movement, interest can be aroused and maintained.
12. **Making language learning interesting**-Language learning should be made as much interesting as possible by using various modem methods and life like situations.
13. **Maximum Actions and Gestures-**A Language teacher. . should ensure that the students try to learn the language with maximum ' use of actions and gestures.
14. **Teaching inductively**-The teacher should try to do without such rules as the pupils cannot frame for themselves. If the student wants to teach verb, the student should not begin by giving its comprehensive definition and then verify his statement by giving a number of examples. Contrary to it, the student should perform a number of actions and write their names on the board.
15. **Principles of passive and active vocabulary**-One objective of teaching English is to increase the vocabulary of students. There are two kinds of vocabulary,

(i) Passive vocabulary-Those words which are recognized and understood, but never used in **speaking and writing** formulate this type of vocabulary.

(ii) Active **vocabulary-Words** which are understood and constantly used by the learner in speaking and writing form active vocabulary. A fruitful learning is one in recognized and understood words are used as active vocabulary. It means words of passive vocabulary should be used as active ones. The teacher should try to use familiar words in the class.

16. **Principles of Gradation**-Gradation mean simplifying the matter. The idea behind the principles of gradation is to simplify the matter to such an extent that language learning becomes easier. It can be done on the basis of-

(*i*) Principle of grouping.

(*ii*) Principle of sequencing.

(*iii*) Grammatical sequence.

(*iv*) Lexical sequence.

(*v*) Semantic sequence.

17. **The principles of correlation with life**-While teaching the subject, matter should be related to life, customs, traditions, peculiarities and characteristics of the particular society to which the students belong. In this way, teaching can be more meaningful and learning can be transferred to real life situations.

18. **Inspirational motive**-Language teaching should be based on inspirational motive. The inspiration should lead the learner to learn more with the zeal of an internal urge. Language teaching should also be based on similar **inspirational motive**. The teacher and the pupil should consider language link as source of inspiration for life.

These are various principles of foreign language teaching. If the teacher wants to teach successfully in the class, the student must follow these principles in teaching.

2.2 APPROACHES TO LANGUAGE TEACHING

The different teaching approaches in this post can be classified into four theoretical orientations: **structural**, **cognitive**, **psychological** and **functional**.

- **Structural**

  Structural approaches believe that language can be reduced to a learnable set of building blocks. There are rules, known as grammar and syntax, that govern how to combine these basic elements. These rules can be memorized to achieve a high level of proficiency in a language. Some proponents would even go so far as saying that there's a predetermined sequence in which a language should be learned. Grammar textbooks are the most commonly used material in this category.

- **Cognitive**

  The cognitive perspective in learning a language puts the learner smack in the center of everything. Cognitive approaches look to answer questions like: How can a language be effectively learned? How does one make a set of vocabulary words memorable and get them embedded in the long-term memory? According to this kind of approach, the techniques, strategies and even the sequence of lessons are learner-led and can't be predetermined. Learning a language is a conscious, rational, information-processing event.

- **Psychological**

  Here, language learning is seen through issues like learner motivation and predisposition, a location's conduciveness to learning, teacher-student dynamics, stress levels, etc. Is the teacher supportive enough to the students? Is the classroom dynamic facilitating or inhibiting the acquisition of the language? Many of the insights in this category are borrowed from counseling and social psychology.

- **Functional/Communicative**

  Functional approaches often emphasize spoken language over written language, and profess that language isn't a set of grammar rules but rather a tool for communication. This has tremendous implications for the types of activities or the materials employed. Anything that lies outside the ambit of passing on meaningful information is just unneeded complication. Communicative approaches often eschew grammar textbooks in exchange for speaking drills and question-and-answer interactions where students get a feel for what speaking the language in conversation is really like.

2.3 DIFFERENT METHODS OF TEACHING ENGLISH AS A SECOND LANGUAGE

The Direct Method

In this method the teaching is done entirely in the target language. The learner is not allowed to use his or her mother tongue. Grammar rules are avoided and there is emphasis on good pronunciation.

Aims

1. Direct method aims to build a direct relation between experience and language, word and idea, thought and expression
2. This method intends for students to learn how to communicate in the target language
3. This method is based on the assumption that the learner should experience the new language in the same way as he/she experienced his/her mother tongue

Merits

1. Facilitates understanding of language – understanding of the target language becomes easier due to the inhibition of the linguistic interferences from the mother tongue, it establishes a direct bond between contexts, and helps in understanding directly what is heard and read
2. Improves fluency of speech – fluency of speech results in easier writing, it tends to improve expression, expression in writing, and it is a quick way of learning and expanding vocabulary
3. Aids reading – reading becomes easier and more pleasant, and it also promotes a habit of critical studying
4. Improves the development of language sense
5. Full of activities, which make it interesting and exciting
6. Emphasizes the target language by helping the pupil express their thoughts and feelings directly in target language without using their mother tongue
7. Develops listening, speaking,reading and writing
8. Increase in market for goods and services
9. Increased employment opportunities
10. Helps in bringing words from passive vocabulary into active vocabulary
11. Helps in proceeding the English language from particular to general, it bridges the gap between practice and theory
12. Makes use of audio-visual aids and also facilitates reading and writing
13. Facilitates alertness and participation of students

Grammar-translation

Learning is largely by translation to and from the target language. Grammar rules are to be memorized and long lists of vocabulary learned by heart. There is little or no emphasis placed on developing oral ability.

Principles

There are two main goals to grammar–translation classes. One is to develop students' reading ability to a level where they can read literature in the target language.[4] The other is to develop students' general mental discipline. The users of foreign language wanted simply to note things of their interest in the literature of foreign languages. Therefore, this method focuses on reading and writing and has developed techniques which facilitate more or less the learning of reading and writing only. As a result, speaking and listening are overlooked.

Method

Grammar–translation classes are usually conducted in the students' native language. Grammar rules are learned deductively; students learn grammar rules by rote,[6] and then practice the rules by doing grammar drills and translating sentences to and from the target language. More attention is paid to the form of the sentences being translated than to their content. When students reach more advanced levels of achievement, they may translate entire texts from the target language. Tests often consist of the translation of classical texts. There is not usually any listening or speaking practice, and very little attention is placed on pronunciation or any communicative aspects of the language. The skill exercised is reading, and then only in the context of translation.

The Audio Lingual Method

The Audio Lingual Method otherwise known as the New Key Method or Army Method is based on a behavirourist theory that things are able to be learned by constant reinforcement. However, just like in the army when someone behaves badly (or in this case bad use of English), the learner receives negative feedback and the contrary happens when a student demonstrates good use of English. This is related to the Direct Method and just like its predecessor it only uses the target language. The biggest difference between the Audio Lingual

Method and the Direct Method is its focus of teaching. The Direct Methods focuses on the teaching of vocabulary whereas the Audio Lingual Method focuses on specific grammar teachings.

The Structural Approach

As the name suggests, the method is all about structure. The idea is that any language is made up of complex grammar rules. These rules, according to this approach need to be learnt in a specific order, for example the logical thing would be to teach the verb "to be" prior to teaching the present continuous which requires using the auxiliary form of the verb "to be."

Suggestopedia

This is a behaviourist theory and related to pseudoscience. This method relies heavily on students' belief about the method's effectiveness. This theory is intended to offer learners various choices, which in turn helps them become more responsible for their learning.

It relies a lot on the atmosphere and the physical surroundings of the class. It's essential that all learners feel equally comfortable and confident. When teachers are training to use the Suggestopedia method, there's a lot of art and music involved. Each Suggestopedia lesson is divided into three different phases – 1. Deciphering 2. Concert Session 3. Elaboration.

Total Physical Response

Total Physical Response, otherwise known as TPR is an approach that follows the idea of 'learning by doing'. Beginners will learn English through a series of repetitive actions such as "Stand up", "Open your book", "Close the door", and "Walk to the window and open it." With TPR, the most important skill is aural comprehension and everything else will follow naturally later.

Communicative Language Teaching (CLT)

The idea behind this approach is to help learners communicate more effectively and correctly in realistic situations that they may find themselves in. This type of teaching involves focusing on important functions like suggesting, thanking, inviting, complaining, and asking for directions to name but a few.

The Silent Way

The Silent Way emphasises learner autonomy. The teacher acts merely as a facilitator trying to encourage students to be more active in their learning. The main of this way of teaching is for the teacher to say very little, so students can take control of their learning. There's a big emphasis on pronunciation and a large chunk of the lesson focuses on it. This method of learning English follows a structural syllabus and grammar, vocabulary and pronunciation are constantly drilled and recycled for reinforcement. The teacher evaluates their students through careful observation, and it's even possible that they may never set a formal test as learners are encouraged to correct their own language errors.

Community Language Learning

This is probably one of the English teaching methods where the student feels the safest as there's a great emphasis on the relationship and bond between the student and teacher. Unlike a lot of the other methods and approaches of teaching English as a Second Language, a lot of the L1 (mother tongue) is used for translation purposes.

Task Based Language Learning

The main aim of this approach to learning is task completion. Usually, relevant and interesting tasks are set by the teacher and students are expected to draw on their pre-existing knowledge of English to complete the task with as few errors as possible.

The Lexical Approach

The Lexical syllabus or approach is based on computer studies that have previously identified the most commonly used words. This approach in teaching focuses on vocabulary acquisition and teaching lexical chunks in order of their frequency and use. Teachers of the Lexical Approach place a great emphasis on authentic materials and realistic scenarios for more valuable learning.

2.4 AUDIO-VIDEO MEDIA IN ENGLISH LANGUAGE TEACHING

Audio Visual Media includes:

- News Bulletins
- Chat shows

- Movies
- Speeches
- Documentaries

Most of the language teachers seem to agree that the use of visuals can enhance language teaching. As they help teachers to bring the real world into the classroom, they make learning more meaningful and more exciting (Brinton, 2000). According to Bamford (2003), it must be take in to account that visual literacy is the key to obtain information, construct knowledge and build successful educational outcomes. the student asserts that this is due to the increase of the number of images in the world (as cited in Harif and Hashim, 2009). It is important to point that students bring to the classroom their own background, that nowadays is associated with images provided by mass media, videogames etc. Santas (2009) reflects on how teachers ask students to think without any of this help, what seems to require convincing them to give up what they have experienced in their lives. Visual aids can be a helpful tool in the language classroom as Mannan (2005) points out they 'help the teacher to clarify, establish, correlate and coordinate accurate concepts, interpretations and appreciations, and enable him to make learning more concrete, effective, interesting, inspirational, meaningful and vivid' (p.108). Visual material or anything use to help the student see an immediate meaning in the language may benefit the student and the teacher by clarifying the message, if the visuals enhance or supplement the language point, as Canning-Wilson (2000) indicates in her work. These advantages suggest that visuals can help make a task or situation more authentic (Canning-Wilson, 1998). Researchers as Kemp and Dayton (1985) claim that visuals aid in motivation and maintaining attention by adding variety and making the lesson more interesting (as cited in Bradshaw, 2003).

Over the past several decades, technology has become a fixture in many homes around the world. Its influence has permeated into all facets of life, including English language teaching. The aim of this study is to explore the impact of integrating media technology in ELT classrooms and to statistically analyze how much it assists learners in acquiring four language skills namely listening, speaking, reading and writing. Integration of media technology began in the 1950s when small language schools began to use the phonograph,

movies and the tape recorder as tools in English language teaching. In the '70s and '80s, audio and video courses were improved through the added use of video projectors and slide shows. By the late '80s and early '90s, language labs were part of many of the more expensive language schools throughout the world. However, by the mid '90s many multimedia language programs became available for teachers on the Internet. In modern era of English language teaching, media technology such as video, pictures, animation and interactive games, CDs or DVDs, the use of internet, chat rooms and video conferencing and Apple's iPad have narrowed distance and turned the whole world into a global community. It provides opportunities to learners to converse not only with local community but with global community as well. It has revolutionized learning and teaching methodologies thereby turning them more enjoyable and productive. According to (Balaaco 1996) digital learning is "just in time" and on-demand delivering knowledge when and where the employees need it. This concept of "anywhere-anytime" is serving learners on the larger scale.

2.5. MEANING AND NEED FOR LANGUAGE LABORATORY

The **language laboratory** is an audio or audio-visual installation used as an aid in modern language teaching. They can be found, amongst other places, in schools, universities, and academies. Perhaps the first lab was at the University of Grenoble in 1908.[1][2] In the 1950s up until the 1990s, they were tape-based systems using reel to reel or (latterly) cassette. Current installations are generally multimedia PCs. The original language labs are now very outdated. They allowed a teacher to listen to and manage student audio via a hard-wired analogue tape deck based systems with 'sound booths' in fixed locations.

Appearance and configuration

The 'traditional' system generally comprises a master console (teacher position) which is electrically connected to a number of rows of student booths (US: carrels), typically containing a student tape recorder and headset with a boom arm microphone. The teacher console is usually fitted with master playback source equipment (tape recorder), some means of monitoring of each booth in the class via the teacher headset and an intercom facility offering 2-way communication between teacher and student. All but the most simple or first generation laboratories

allow the teacher to remotely control the tape transport controls of the student booths (record, stop, rewind etc.) from the master desk. This allows for easy distribution of the master programme material, which is often copied at high speed onto the student positions for later use by the students at their own pace. Better tape laboratories housed the tape machine behind a protective plate (leaving only a control panel accessible to the students) or locked the cassette door. This kept the expensive and sensitive decks free from student misuse and dust etc. The principle of a language lab essentially has not changed. They are still a teacher-controlled system connected to a number of student booths, containing a student's control mechanism and a headset with a microphone. Digital language labs have the same principle. A software-only language lab changes the concept of where and what a language lab is. Software can be installed and accessed on any networked PC anywhere on a school, college, or university campus. Software-only systems can be located in one room, from room-to-room or campus-to-campus.

Advantage

There are different features of language lab, which make the students to have interactive session. It provides equal opportunity to all the students to hear the instructor irrespective of place where they are seated. There will be less miscommunication because of direct nature of the sound transmission. It also provides the privacy that encourages the shy students to speak without any hesitation. In addition instructor can speak to individual or group of students in privacy without interrupting rest of class. Language labs motivate students to talk freely and lose the shyness when talking in front of their friends. Attention on subject is increased resulting in better retention of the concepts. Furthermore, it develops the listening and communication skills, since they hear correct pronunciation through their headphones. Learner will show more enthusiasm and excitement in learning lesson because of learning lab system. Teacher can look after each student, which is not possible in case of the regular classroom. In a lab instructor can communicate with many students by pressing a mouse key in order to talk with students. Efficient use of time and learning efficiency is much more than usual classroom learning. This set up fosters more interactive session between students and teacher. The language lab brings variety in teaching learning process instead of boring verbal centered teaching.

The student's progress can also be monitored regularly so that teacher can provide feedback based on individual pace and ability. Finally, the students can learn the lesson at their own pace thus allowing the classroom as student-centered approach.

Disadvantage

It is very expensive to set up the language lab in country like India. There is no lab syllabus and usually language classes are conducted as theory. Moreover, the lab can engage maximum of 60 students hence space is also difficult for school. These days student does not have enough patience to listen to pronunciation and practice them so the recording of pronunciation is useless. As the teacher listens to students randomly the response can be unorganized and ineffective as there are many students to attend to. The teacher should be well trained in executing the language lab effectively. Given the nature of teaching, a language teacher may need an assistant in taking care of the technological part while teacher attends to the instructional components. As technology changes rapidly, there should be a provision for upgrade in the medium of instructions, which can be burden for school in terms of finances. The ministry of education should consider allocating funds to set up as well as maintenance of language lab. If all these basic problems can be solved only then the teacher can think of implementing language lab in our curriculum.

Chapter-3

EDUCATIONAL TECHNOLOGY FOR FORMAL, INFORMAL AND NONFORMAL SYSTEMS IN LEARNING: CONCEPT AND SCOPE

3.1 ROLE, EXPERIENCE AND APPLICATIONS OF EDUCATIONAL TECHNOLOGY IN SCHOOL EDUCATION AND HIGHER EDUCATION

Computers in school

Education systems around the world face formidable challenges that are taxing conventional strategies. Now after more than two decades of unfulfilled promises to revolutionize education, computer and communication technologies are finally able to offer opportunities to significantly improve teaching and learning, strengthen teacher professional development and support broad educational reforms. One hallmark example is of the 10 year long Apple Class-room Of Tomorrow (ACOT-1996) examined the effect of computers in teaching and learning shows that 'students' behaviour and attendance improved along with their attitude toward themselves and toward learning, such as-clearly performing better than before, student wrote more effectively and with greater fluidity and finished whole unit quickly.' Computer is an efficient and effective for verities of purposes in school. It is a modern tool for improving the quality of teaching and learning. Schools are expected to provide the opportunity to students not just to complete school successfully, but also to empower them to be successful in the 21st century. Educational technologist are advocating computer skill into the content areas, proclaiming that computer skill that should not be taught in isolation and separate computer class do not apply computer skill in meaningful ways. If the teacher see in schools,

computer literacy means not only know how to operate computers but also to use computer as a tool for organisation, communication and problem solving. Following are the points that enhance the use of computers in the school. i. Availability of computers to the learner is more frequent in comparison to teachers. ii. Computer are patient teacher, they never tired and never loose their temper. iii. The computer can employ various teaching techniques that may be otherwise difficult to use in a classroom. iv. Student can learn at his or her own pace through computer. v. Learners may less frighten by computers than teacher. So they can learn through computer without any hesitation. vi. Learning with computer is personalised process, so it suitable for average intelligent student as they can learn at their own pace and conveniences. vii. Computer is very effective in teaching Physics, Biology, Mathematics and history. 8 viii. Computer can overcome the legibility of handwriting, coaching occur rather than lecture and recitation. ix. It allow teacher to perform the other task more effectively by using their time for other activity, which are not possible through computers, the teacher can extend his or her role beyond the class room. x. Future demanding high technocrat competitive global environment develop. Usage of computer brings the entire world into the classroom. It is very clear that computer is useful and versatile tool. It can be used to help solve the problem and accomplish the tasks. Computers are used in different context… Using computer as a tutor can be effective way of infusing thinking skill into subject area teaching and learning. This is because with the right teacher input and software design around computers can turn the use of reasoning skill into learning outcome. Software can be designed to initiate, resource and frame a discussion just as a teacher can. Computer can be used as a mindtools. It is an application in which student to represent what they know, necessarily engage themselves in studying. Mindtools scaffold different forms of reasoning about content. That is they require students to think about what they know in different, meaningful ways. For example using database to understand student. It is not the computer that directly teach thinking but after working in partnership with computer, the student will internalise the way that computer think as a cognitive tool for their own use. It can allow students to engage directly in knowledge creation with others who are not present physically. In absence it is more motivating and can stimulate a higher quality of thought. The

computer can be used as a support and resource for the communicative processes of teaching and learning. Computer mediated interaction with the students, used in the right way can move us beck to a basic one student working with a teacher to learn. Thus computers in the school are shifting paradigm of bullock cart wheel to the Mouse wheel.

The role of technology, in a traditional school setting, is to facilitate, through increased efficiency and effectiveness, the education of knowledge and skills. In order to fully examine this thesis, the teacher must first define several terms. Efficiency will be defined as the quickness by which the teacher obtain knowledge, while the term effectiveness is associated with the amount of imparted knowledge that is operationally mastered. When technology is directly applied to an educational setting, such as a school, both the students and teachers can be viewed as learners. Thus, the teacher can operate under the assumption that any increase in teacher knowledge and utilization has the impact of increased learning in students. Ultimately, technology should serve to increase student achievement in schools. Technology can aid in educational achievement through two primary methods: the removal of physical barriers to learning and the transition of focus from the retention of knowledge to its utilization. Each of these methods must be examined in the context of their relation to both the student and the instructor in order to see their value and effect in educational settings. The removal of physical barriers has allowed teachers greater accessibility in regards to professional development and graduate education. Before the age of the internet and the advent of distance learning, engaging in a learning community, such as a workplace network or a school, required a close degree of physical proximity amongst community members. Presently, there are multiple examples of the use of distributed learning technology in the educational field. First, many graduate schools have begun transitioning into programs that allow for distance education. No longer is it a necessity that teachers have geographical proximity to a university in order to pursue higher education and certification. This trend towards online classes and educational opportunities has even become so prevalent that there are universities which consist of only online classes, allowing a teacher to complete an entire course of study through distance learning (Dempsey & Van Eck, 2007). Second, the use of distance learning is not limited to the university setting, but also found in school site, district, and state levels of professional

development for teachers, with the emergence of web-based conferences and seminars. In addition, internet based technology allows for teachers to form their own learning communities that are not confined to the local school site. For example, science teachers may use a wiki or content delivery system to network and share information with teachers at other schools both within and beyond their local school district. Even more exciting, is the premise that teachers can not only receive information and training from a central authority, such as district or state personnel, but that teachers may develop content and share their information amongst their peers. This leads to situations of reciprocal teaching and mentorship that are part of a larger informal learning community. In terms of design, online learning communities allow for a multitude discussions and socialization that adhere to a constructivist learning principle, in which people effectively learn information when experiencing and defining knowledge through social contexts (Dempsey & Van Eck, 2007). Students also benefit from the removal of physical barriers through distance learning technology. In contrast with their teachers, who are focused on professional development related to their job performance, students are often learning new content and that content is often removed from their daily lives. This separation between the content being disseminated and the students' daily interactions and prior knowledge is even more prevalent in lower grade levels. For example, students may learn the math necessary to balance a budget, before they even get their own checking account or have a checkbook. However, technology can assist students in the visualization of previously unfamiliar content in a manner which assists in learning. For example, multimedia presentations, which utilize multiple formats of media, such as images, narration, and text, can be used to assist students in concept visualization. Other formats, such as simulations and games can add an extra level of interactivity between the student and the content, which turns the educational process from a passive to an active process. Proponents of multimedia adhere to a cognitive learning philosophy and view the primary advantage to multimedia learning as the usage of multiple learning channels, under the assumption that any one sensory channel can only process a limited amount of information at once (Driscoll, 2007).

Even more beneficial is the use of educational technology, in particular multimedia and simulations, to remove physical barriers

such as location and financial limitations. For example, students can view images, which may even consist of videos, of distant landmarks and geographical locations, in lieu of physically traveling to the site. While it may be unfeasible to arrange a field trip for even a few students, all students with access to the internet can use three dimensional and geographic programs to figuratively walk through a distant area. The cost of this aforementioned geographical technology is one of its great advantages, as this technology can be readily accessed for no cost through technology provided by the corporation Google and their web based map tools.

The second impact of technology is one with long lasting effects on the future of education. Technology, through the development of searchable databases that are now even accessible on remote handheld devices, will change the way the teacher define learning objectives. Specifically there is a transition from the memorizing and recitation of facts and information to the utilization of skills and the development of skills that allow for improved research and the evaluation of other sources, such as online databases. The mass collection of knowledge leads to an evolving technological field known as knowledge management. Rosenberg (2007) defines knowledge management as "the creation, archiving, and sharing of valued information, expertise, and insight within and across communities of people and organizations with similar interests and needs, the goal of which is to build competitive advantage"(p.157). Knowledge management is the basis for an instructional method known as blended learning, where individuals are taught within traditional means such as the classroom, but also through technological means (Rosenberg, 2007). As the teacher develop a greater reliance on technology and the advantages that come with its usage, the teacher can expect traditional learning for both students and teachers, to achieve a blended status, with increased reliance on technological repositories of knowledge. For teachers, technology, in accordance with knowledge management principles, can be used to develop databases that will alter professional development. One emerging database technology is known as the electronic performance support system (EPSS). An EPSS provides professional development and job related assistance whenever an individual may need such information (McKay & Wagner, 2007). An EPSS goes beyond the simple information storage functions of a

database, and can also provide case studies, templates, and situational examples for use by the individuals (McKay & Wagner, 2007). For example, if a teacher has a question on how to write lesson plans in accordance with school district requirements, they could go to an EPSS provided by the district and find instructions and information on how to perform their task. This support system allows the teacher to receive help in a very time efficient manner, as the teacher is not required to find an individual who has the specific knowledge and the time required to instruct the teacher. In addition, the higher the sponsor of the EPSS, such as a federal government sponsored EPSS, the greater the numbers of individuals that can be served by a single database and adhere to the same standards of job performance.

3.2. ROLE, EXPERIENCE AND APPLICATIONS OF EDUCATIONAL TECHNOLOGY IN SPECIAL GROUPS: SPECIAL EDUCATION AND DISTANCE EDUCATION

One tool to help students with disabilities even in the face of a special education teacher shortage is assistive technology. Today, assistive technology can help students with certain disabilities learn more effectively. Ranging in sophistication from "low" technologies such as a graphic organizer worksheet to "high" technologies including cutting-edge software and smartphone apps, assistive technology is a growing and dynamic field. Several areas of assistive technology and sample products may be found in any given classroom, making a difference in how students of all abilities learn.

Text to Speech

As an assistive technology, text-to-speech (TTS) software is designed to help children who have difficulties reading standard print. Common print disabilities can include blindness, dyslexia or any type of visual impairment, learning disability or other physical condition that impedes the ability to read. However, other students can benefit from TTS technology, such as children that have autism, attention deficit hyperactivity disorder (ADHD) or an intellectual disability. The technology works by scanning and then reading the words to the student in a synthesized voice, using a large number of speech sounds that make up words in any given context. With the advances in speech synthesis, TTS technology is more accurate and lifelike than ever.

Intel Reader

The Intel Reader is a mobile handheld device that uses TTS technology to read printed text aloud. It features a high-resolution camera that captures printed text, converts it to digital text and reads it to the user. During playback, words are highlighted as they are read aloud, and the user can pause and have the device spell out highlighted words. The available Intel Portable Capture Station functions as a stand for the Intel Reader to easily and quickly capture text from books and other documents. At about the size and weight of a paperback book, the Intel Reader is mobile enough to use in any environment. Students can also transfer content from a home computer, or save generated audio versions of printed materials to a computer. Available voices vary in gender, pitch and speed.

Kurzweil3000

The Kurzweil 3000 is a leader in TTS software for individuals that struggle with literacy. In addition to a range of TTS features, the full-featured software program integrates abilities that can help students in other areas, potentially appealing to those who may have a non-print disability or those who may not typically consider a TTS program. Some of the features include:

- Multiple TTS voices
- Support for 18 languages and dialects
- Talking spell-checker
- Picture dictionary graphics for more than 40,000 words
- Text magnification
- Tools for test taking, essay writing, note taking, reference and more

The Kurzweil 3000 strives to provide students with a multi-sensory approach to literacy learning. It is available for Windows and Macintosh.

Graphic Organizers

Graphic organizers can be effective in helping students organize their thoughts during the writing process. As an assistive technology, graphic organizers can be a strong choice for students with dysgraphia or disorders of written expressions — particularly the conceptual aspects

of writing. Graphic organizers work by helping the student map out a course of action. Depending on the type of writing, the graphic organizer can prompt the writer to describe an object, chart out a course of events or perform some other task that can help in planning the piece. Graphic organizers vary by type and technological sophistication.

Low-Tech Handouts

Graphic organizers do not need to be technologically advanced; in fact, they can exist in simple handout form. Sample handouts can be found at the Houghton Mifflin Harcourt Company. The sandwich chart can assist students with paragraph writing. The sequence chart can help with narrative writing and the ordering of events. The sense chart is designed for descriptive writing, where writers are prompted for terms that characterize and express an item. Dozens of other sample charts exist and can help students with virtually any type of writing.

Draft: Builder

Draft:Builder is a writing tool that integrates outlining, note taking and draft writing functions to break down the writing process into three steps. Using a graphical organizer, the program helps the student visualize the project and insert information into the appropriate place without having to conceptualize the whole process. It then automates the process of creating the paper, where the student can drag and drop what is written in each note to the rough draft. Other features include a talking spell checker that uses TTS technology, a bibliography tool, a dictionary and the ability for teachers to add locked text into the program for further guidance. Draft:Builder is available for Windows and Macintosh.

Assistive Listening Systems

A variety of assistive listening systems, or hearing assistive technology, can help students who are deaf or hard of hearing, as well as those with other auditory and learning problems. According to the National Association for the Deaf, assistive listening systems can be used to enhance the reach and effectiveness of hearing aids and cochlear implants, or by children who do not need those tools but still need help hearing. Assistive listening systems use a microphone, a type of transmission technology and a device for capturing and bringing the sound to the ear.

The specific transmission technology used in the system is typically what contrasts one type of assistive listening system from another.

FM Systems

According to the American Speech-Language-Hearing Association (ASHA), FM systems are the best choice for children with sensorineural hearing loss. The most common type of hearing loss for all ages, sensorineural hearing loss occurs when the inner ear (cochlea) or nerve pathways from the inner ear to the brain are damaged. FM systems work using radio broadcast technology. With a transmitter microphone and a receiver, the teacher and student can maintain a consistent sound level regardless of distance and background noise. Additionally, ASHA notes that the hearing aid microphone can be turned off, so the student can concentrate on the teacher alone.

Sound-Field Systems

Sound-field systems are a strong choice for classrooms that need to assist listening for all children in the class. ASHA notes that these systems benefit not only children that have hearing loss, but those that have other auditory and learning problems, such as language delays, central auditory processing disorder, articulation disorders and development delays. Additionally, sound-field systems can be used for students who are learning English as a second language. Sound-field systems use a microphone that projects sound through mounted speakers around the classroom. In classrooms that have good acoustics, sound is able to travel evenly throughout space, eliminating problems of distance between the speaker and each listener.

Sip-and-Puff Systems

Sip-and-puff systems are used by students who have mobility challenges, such as paralysis and fine motor skill disabilities. These systems allow for control of a computer, mobile device or some other technological application by the child moving the device with his or her mouth. Similar to a joystick, the child can move the controller in any direction and click on various navigational tools using either a sip or a puff. An on-screen keyboard allows the child to type using the same movements. Sip-and-puff systems are a type of switch device, which refers to the technology used to replace a computer keyboard or mouse. Other switch devices include

buttons or other objects that a student can touch, push, pull, kick or perform some other simple action that can then control the device.

Jouse3

The Jouse3 is a sip-and-puff system that allows children to control a device using any part of the mouth, cheek, chin or tongue. Due to its accuracy and quick response, home users can use it for drawing or computer games. It can mount to the desktop, a bedframe or any other type of structure; it does not require a headpiece or placement on the body of the user. The product supports Windows, Macintosh, Linux and Unix based computers, in addition to Android and iOS mobile devices. It can support one or two external switches, and has two types of mouthpieces.

Sip-and-Puff Systems From Origin Instruments

Origin Instruments offers a range of sip-and-puff products that students can use to control an electronic device. Using a head mounted or gooseneck user interface, or available tubing for a custom solution, the child can control a mouse, joystick or keyboard with ease. The primary system is powered using USB technology. The product supports Windows, Macintosh and Linux based computers. Two pressure switches connect the system to the user interface solution for use on electronic devices.

Proofreading Software

Proofreading software is a branch of assistive technology that goes above and beyond the typical proofreading features found in a word processing system, such as correcting words frequently misspelled by students with dyslexia. A number of other features offered within this category can help students work on his or her English skill set to become a more effective and accurate writer.

Although primarily geared towards individuals with dyslexia, proofreading software can be helpful to those with any type of learning disorder that makes writing and reading challenging.

Ginger

Ginger offers several features that can help students with dyslexia and other learning disorders with writing. It is also designed for speakers of languages other than English. Some of the features include:

1. Grammar checker that analyzes context to determine any errors or misspellings. For instance, Ginger can recognize whether “there,”

"their" or "they're" should be used in a sentence, which is a common mistake in writing.

2. Word prediction and sentence rephrasing tools that can be helpful for students learning how to construct sentences properly.
3. TTS functionality so students can hear what they've written.
4. A personal trainer that provides practice sessions based on past mistakes made by the student.

Ginger is available for Windows and Macintosh systems, as well as for use on iOS and Android mobile devices.

Ghotit

Ghotit is specifically designed for students with dyslexia and other learning disorders who have difficulties with writing. The name is inspired by the word "Ghoti," which is a constructed term that illustrates irregularities in the English language. And since many spellings are counterintuitive — especially for those with dyslexia — Ghotit dedicates itself to assisting children and adults who struggle with writing accurately. It features the ability to learn from the user's past mistakes, personalizing suggestions for spelling and grammatical errors. Ghotit can predict words, check passages of text contextually, read text aloud using TTS technology and recognize split and merged words. It also includes an integrated dictionary for students to quickly look up a word.

Math Tools

A range of technology and tools can help students that have trouble with math, most commonly found in a learning disability called dyscalculia. Dyscalculia makes it difficult to grasp numbers and it is characterized by a general lack of understanding in the field of math. Assistive technology in math is not just for those with dyscalculia. It can also help students with blindness, fine motor skill disabilities or some other type of disability that makes it difficult to perform math-related work.

MathTalk

MathTalk is a speech recognition software program for math that can help students with a range of disabilities. From prealgebra to Ph.D.

level mathematics, students can perform math problems by speaking into a microphone on their computer. The program works with Dragon NaturallySpeaking programs for voice-to-text functionality, making it ideal for students who have fine motor skill disabilities. Students with blindness or vision disabilities can use the integrated braille translator. In addition to these audiences, MathTalk also appeals to students with dyscalculia. The program functions as an electronic math worksheet, allowing the child to organize, align and work through problems on the screen, making it helpful for students who have difficulties performing math problems on paper.

MATH SIMULATIONS

Math simulations can help students with dyscalculia visualize math problems and concepts. As a result, students can better understand the application of a particular type of problem, since many students struggle with the conceptual aspects of math. Examples can be found at the NASA website. From video to animated simulations, teachers and students can visually see how a math concept or problem would work. And with some math simulations, students can work through the problem and then see the result play out in the simulation.

The Takeaway for Students, Parents and Teachers Thanks to the rapid advances in assistive technology, students, parents and teachers have a seemingly limitless number of tools at their disposal.

As these tools start to appear in the home and in the classroom, parents and teachers can utilize them for students' academic and personal growth. But technology alone is not enough – to successfully use these tools, it's critical to develop a plan for their use and have regular check-ins to ensure the student is gaining the most value possible and not becoming overly reliant on these tools. But while assistive tools have become plentiful, the same cannot be said for special education instructors. As previously mentioned, the vast majority of states in the 2014-15 school year reported a need for teachers in special education. And many general education classrooms instruct children with special needs.

Certification is a faster way for current teachers to qualify to teach this growing population. At Alvernia University Online, teachers can pursue a **special education certification** for grades PreK-8 or 7-12 to help make a difference for children with special needs. They will

also improve their marketability in the process, gaining additional opportunities for their career. Overall, more teachers are needed in this area. Although the advancement of technology in special education is promising, the same increase is needed for the number of special education instructors. Certification offers one solution to quickly meet this need.

There are many types of distance education technologies. During this course the teacher will be concentrating on videoconferencing. With videoconferencing the teacher can not only see and hear all program participants but the teacher can integrate other non-real time resources that make the learning environment more powerful than face-to-face instruction. The ability for students to see and hear the instructor brings high levels of interaction to the distance education experience. In addition, videoconferencing can be easily and effectively blended with the other distance education technologies.With so many distance education technologies to consider, it's easy to feel overwhelmed and confused. But learning about the variety of distance education technologies, isn't as difficult as it may seem. They can be quite easily divided into four general categories: Print, Audio, Video, and Computer. Distance education technologies are based on one, or some combination of these four categories:

Print	Audio	Video	Computer
Correspondence Print Materials Fax	Audioconferencing Voice mail	Telecourses Videotapes One-way video Interactive television (videoconferencing)	Self-paced packages Webconferencing Internet, email, www Collaborative software, CD-ROM

Print

- In correspondence study, students learn largely through developed Print Packages. Increasingly, however, correspondence programs are also including audiotapes, videotapes and web components.
- Print is also often a component part of videoconferencing courses, i.e. brochures, letters binders, etc.

- Fax machines allow for the transmission of hard copy text and visuals between the sites. Instructors often use the fax to transmit information that failed to reach a site, while students regularly use the fax to transmit assignments and reports.

Audio

- Audioconferencing links individuals or groups by telephone at multiple sites and provides a low-cost opportunity for instruction and interaction. Audioconferences are often incorporated into programs and courses that use other technologies.
- With Voice Mail, instructors and learners have the capability of leaving messages when the person they are calling isn't available. These messages can then be answered at the person's convenience. Faculty can update assignments and provide feedback, while students ask questions and carry on valuable communication.

Video

- Telecourses are pre-produced television programs on videotape that are usually accompanied by a study guide and are distributed via broadcast or cable channels. In some instances they are viewed in real time, and in others they may be downloaded, taped, and viewed by learners at a later time.
- Many courses and programs are developed and produced specifically for use on Videotape, which provides cost effective training and instruction. Videotapes are often designed as a component of print materials. These tapes and materials can then be played by students at their convenience.
- One-way Video is video transmitted over delivery technology and is often referred to as Business TV. These live programs and courses are created to be sent to multiple sites. With the right software and hardware, it is becoming increasingly common to receive one-way video via desktop computers. With each of these technologies, it is also possible to incorporate audio via phone or a return key.
- With Two-way Video Two-way Audio or Interactive Video or videoconferencing, instructors and students can see, hear, and interact with each other. This increases the potential for highly interactive learning experiences. In addition, other technologies and

media can be integrated into the system, providing the capability of a rich learning environment.

Computer

- Computer self-paced packages are increasingly being designed for learners who want flexibility of both time and place. These packages can be purchased by an individual or distributed over a local area network (LAN) or wide area network (WAN.)
- Webconferencing is a relatively new technology that is taking the place of earlier audiographics technology, which limited participants to specific sites. Webconferencing uses a web browser and software that provides voice and graphics interaction among participants at their desktops. With this technology, PowerPoint© slides can be uploaded to the software and numerous other tools can be used for providing information or for interactive participation. In addition, applications can be shared and edited by participants at the various locations.
- The Internet provides students the opportunity to link into a network of computers. Once on the Internet, other tools are also available: the rich resources of the World Wide Web (www), the capability, with the appropriate software, to email anyone with an email address, to send Attachments and to access audio and video.
- Collaborative and Group Software offers distance education students ways to work interactively on documents by editing and changing them. With this type of software, students can post messages on a bulletin board system or meet in designated "virtual chat spaces" to communicate in "real time" or asynchronously.
- CD-ROM, which stands for Computer Disc Read Only Memory, is a computer storage medium similar to an audio CD.

Blending Distance Education Technologies

Blending Distance Education Technologies gives the teacher and learner the options of using the most appropriate technology to fit the specific learning situation. While for teaching purposes, dealing with one technology at a time, in a linear manner, may make sense; in the overall learning process utilizing many technologies, fitting them to the

specific needs of the learner is more effective. Most of the technologies can be used in combination with each other. In this course, for example, the teacher are utilizing videoconferencing, the World Wide Web, the internet, email, fax, print materials, and probably others as the need and opportunity arises.

3.3. INTERPERSONAL APPROACH: IEC, SOCIAL MARKETING APPROACH, PARTICIPATORY COMMUNICATION APPROACH

IEC

Communication is an integral and important component of the total health programmes. Communication has attained greater importance in health promotion and development. Communication is the back-bone of Modern Society. If community participation is the heart of Primary Health Care, Communication is the blood.

It is a link between the health providers and the community. Community participation is the corner-stone for communication. Communication is a means to mobilising the people and seeking their willing co-operation in political, social, health and economic developments. The main role of communication is providing information, persuasion, motivation, reminding and influencing the behaviour of the people.

In developing countries, Communication plays an important role in changing the knowledge, attitude and behaviour of the people. As stated by the WHO Expert Committee (TRS 690). "If people are to fulfil their role in Primary Health Care, they have to be well informed and this is an important function of health providers and the Mass Media". For changing the behaviour of the people, worker has to involve the people adequately and appropriately by providing scientific information. Then only, people will understand and realise the need and importance of Health and Eye Health Care.

Communication provides situation in which people educate themselves and to achieve health by their own actions and efforts. Knowledge alone is not enough to change behaviour. Beliefs and attitudes are also essential to change the behaviour. Basically, IEC is the selling of concepts and services through community involvement and participation

IEC is a concentrated pre-planned educational endeavour with specific objectives, focussed towards specific programme goals in

order to reach specific audience either in individual, or group settings through skillful use of proper methods and media.

Information

The word 'Information' in Social Interaction, is used in different ways. the teacher speak of useful, valuable, factual, reliable, precise true information and so on. Information is about something. It can be about an object, people, situation or events etc. The information involves informants, advisers, reference book compilers as well as those act on the information.

Clarity, usefulness and value of certain information depends upon the person, his needs and circumstances. The reliability depends upon the personal experience of that particular source of information. Factual or preciseness do not require a person or user. For example the following statements convey increasingly precise information to anybody. For creating potential action in the recipient, semantic precision is necessary.

1. "A car will leave from somewhere, for elsewhere soon"
2. "A car will leave from Madras for Madurai today".
3. "A non-stop car will leave from Madras Central Bus stand for Madurai at 10.30 AM. Today".

Information adds to the store of knowledge of an individual Information in an organised way is concerned with transfer of facts. Information is mainly used to inform the people about Government policies, plans, programme achievements, etc.,

Function of Information

- Reduces uncertainity or disorganisation
- Regulate the level of social tension.
- "Temperature controlling Agent" Raise social aspiration. 4. Fill the gap in knowledge and create awareness
- Inspire people to move.

Education

Education is concerned with opening out the horizons to choose his interests and mode of living. It is a process of continuous interaction in which both teachers taught and get benefitted. It helps to mould the

behaviour pattern of man and to adjust himself. Educational process is a planned effort to achieve pre-determined objectives related to thinking, feeling and practices.

Communication

Communication is a process of transmission of ideas, thoughts, feelings, behaviour from one person to another and thus to obtain desirable response to what is being transmitted. The IEC strategies adopted in Govt./NGO's in promoting people's involvement for Health and eye health programme with special reference to group and intersonal approaches are as follows:

- Identifying the communication needs to plan IEC activities
- Training Health Functionaries
- Training of Community leaders/Volunteers
- Training of Mothers(M.S.S.)
- Training and working with TBA, Indigenous Medical Practitioners. Involvement of Health related sector personnel - A WW,CNW, Teachers Gramasevaks, Animators and postmasters.
- Use of Satisfied adopters
- Involvement of NGO's
- Adopting Social Marketing Technique
- Effective use of Mass Media for back-up (Cable TV, Folk Media) Strengthening inter personal communication and
- Follow-up of the programme.

IEC approaches

People vary in their life-style and the level of knowledge. An uniform lEC approach may not be suitable. So, a mixture of different approaches may be used depending upon the local situation, audience, purpose, programme needs and felt needs of the community. These could be classified as

1. Group Approach
2. Individual Approach

Each approach has its own advantages and limitation depending upon the purpose and situation. For interpersonal and group approaches,

appropriate methods and media have to be selected depending upon the community and content of the messages. It is also better to find out already existing communication channels and level of information through KAP study. Based on the KAP findings, the worker has to select methods and media suitable on promoting people's involvement with special reference to interpersonal and group approaches. Common methods and media which are suitable for rural areas for interpersonal and group approaches are given below: Methods and Media for Group and Interpersonal Approaches:

Communication

Approaches	Method	Media
Group Approach	1. Group Discussion 2. Demonstration 3. Role-play	1. Film 2. Tape-recorder 3. T.V. 4. Video 5. Flashcard 6. Flannel-graph 7. Puppet-show 8. Flipbook 9. Booklets 10. Leaflets
Inividual Approach	1. Home visit 2. Individual contact 3. Counselling	1. Photo-folder 2. Booklets 3. Leaflets 4. Kits 5. Flashcards 6. Models

Both mass media, interpersonal communication have their individual and complementary roles. Information transmitted by media carries a certain amount of weightage. Interpersonal communication helps to reach deeper into the attitudinal and motivational core of the individual. It also helps to decision making process and to solve psychological problems. Feedback is possible in interpersonal communication when both are combined, the chances of influencing people to take appropriate actions are greatly increased. Mass communications cannot replace face to face approaches.

Each has its definite and well defined objectives. Mass Media programmes are best followed up with the effective system of

interpersonal communications, so that awareness can be converted into actions without any lapse of time.

Strategies to improve both IEC activities and service deliver are to

1. Increase the reach of services by making visits of workers and supervisors more predictable and regular;
2. lmprove quality of services through knowledge and skill development of workers;
3. Make supervision more oriented towards problem solving;
4. Link supervision with training at various levels;
5. Concentrate on local field problems, both for development training materials and their uses;
6. Combine interpersonal communication strategy with mass media approach;
7. Streamline supply systems to meet the local needs of health and family welfare units; 8. Establish relationship between various levels and elements of the system and 9. Improve performance levels through continuous interaction with village community volunteers.

Social Marketing Approach

Established as a strategy to address social problems, social marketing reflects commercial-sector developed marketing technologies applied to the social problems that are resolved by behavior change (Andreasen, 1995; Gracia-Marco et al., 2011). Social marketing has been used in a variety of successful community healthy behavior change projects, and has been critically analyzed in recent reviews (Middlestadt et al., 1996; Quinn et al., 2010). The efficacy of social marketing has been examined with a wide range of benchmarked successes. For example, Gordon et al. (Gordon et al., 2006) assessed the evidence for social marketing in nutrition and physical activity (PA) behavior change showing increases in knowledge and 'reasonable' efficacy in influencing psychosocial variables. Most conclusions from reports that evaluated the efficacy of social marketing in behavior change interventions suggest that social marketing is effective in different target groups such as young people, minority ethnic and disadvantaged groups.

Approaches to Development Communication

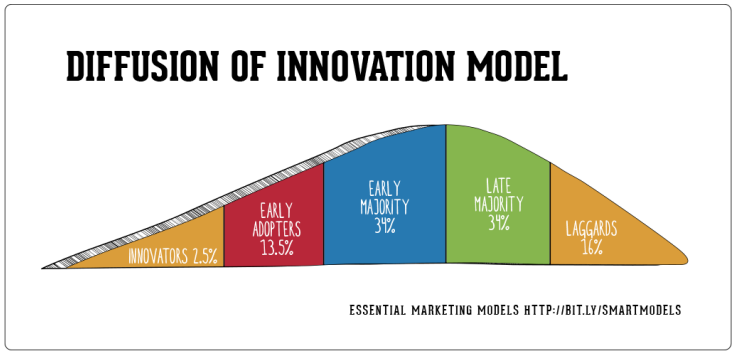
There are varied approaches to handle development communication which are not

exclusive to each other. The main approaches are:

1. Diffusion/extension approach
2. Mass Media approach
3. Development support communication approach
   4. Institutional approach
5. Integrated approach
6. Localized approach to Dev Com
7. Planned strategy to Dev Com

Diffusion/ extension Approach to Development Communication

The **main focus o**f this approach is the adoption of technological and social innovations through diffusion of new ideas, services and products. **Diffusion of** both material and social innovations is necessary for development. Material innovations refer to economic and technological innovations and social innovations pertain to social needs and structure.



The process of diffusion starts with the need of individual and community decisions for acceptance and rejection of innovations depend primarily on the needs of the adopters. The resultant consequences of diffusion can be direct/indirect, latent/manifest, and functional/ dysfunctional. The early models of diffusion focussed only on material growth. But it was soon realized that social growth along with material growth was necessary for diffusion of products, ideas and services.

Therefore, diffusion decisions have to handle the economic, technological and social constraints.

Mass Media Approach Development Communication

A well-defined developed mass media and interpersonal communication infrastructure is necessary for development communication. It is necessary that these infrastructures should be accessible to the people, both physically and socially. The content of the messages should be balanced. The content should be both rural and urban oriented and addressed to masses in both sectors. The messages should be need-based and they should appeal to the audience.

The integrated approach to development communication emphasizes the need to avoid duplication and waste in development efforts. The balance in the spread of information facilities must be maintained both for rural and urban, backward and prosperous areas.

Institutional approach focuses on education for development.

The emphasis is on literacy-universal education, adult education, formal and non-formal education. There is emphasis on need-based training and development – oriented programmes conducive to development.

Development support communication: In the development context, communication strives not only to inform and educate but also to motivate people and secure public participation in the growth and change process. A widespread understanding of development plans is an essential stage in the public cooperation for national development.

Development communication and development support communication are thus two different terms.

Development Communication communicates development messages to people for betterment of their economic and social conditions, where Development Support Communication addresses development planning and the plan of operation for implementation. But often these two terms are substituted for each other.

Planned Strategy for Development Communication: The success of development communication depends on team approach, i.e. the coordination between the communication agencies (extension workers, radio, TV, Press, etc.) and development agencies.

Community-based communication system approaches may be evolved to ensure greater participation of local people in planning and production of communication material which is community-based.

Participatory Communication Approach

Participatory communication is an approach capable of facilitating people's involvement in decision-making about issues impacting their lives - a process capable of addressing specific needs and priorities relevant to people and at the same time assisting in their empowerment. In fact, participatory communication is "a necessary component, consistent with a democratic vision of international development, needed to increase projects sustainability and ensure genuine ownership by the so-called 'beneficiaries'."

Promoting the sustainable and systematic use of communication in the development process helps to ensure people's participation at all levels, as part of an effort to identify and implement appropriate technologies and policies for the prevention of poverty.

Participatory communication is a term that denotes the theory and practices of communication used to involve people in the decision-making of the development process. It intends to return to the roots of its meaning, which, similarly to the term community, originate from the Latin word communis, i.e. common (Mody, 1991). Therefore, the purpose of communication should be to make something common, or to share...meanings, perceptions, worldviews or knowledge. In this context, sharing implies an equitable division of what is being shared, which is why communication should almost be naturally associated with a balanced, two-way flow of information."

The Four Phases of the Communication Program Cycle The communication program cycle can run parallel to the project cycle when they both start at the same time. As presented in Chapter 1, the basic phases of a communication program can be classified as:

- Participatory Communication Assessment (PCA) is where communication methods and tools are used to investigate and assess the situation;
- (Participatory) Communication Strategy Design is based on the findings of the research and defines the best way to apply communication to achieve the intended change;
- Implementation of Communication Activities to determine where activities planned in the previous phase are carried out;
- Monitoring and Evaluation runs through the whole communication program, monitoring progress and evaluating the final impact of the intervention.

3.4. MEDIA APPROACH: DEVELOPMENT COMMUNICATION APPROACH, DEVELOPMENT SUPPORT COMMUNICATION APPROACH AND MEDIA FORUM

Communication is a two way process where messages flow both ways. Communication also refers to that use of different forms of media, such as print, electronic media (radio, television), new media etc. These media are used as an empowerment tool, i.e. it is used as a tool to facilitate and encourage the participation of people in developmental activities. Different mass media is used to effectively communicate knowledge and information to people for developmental purpose. The term _Development Communication' can be divided into two terms, i.e.— Communication and Development. Here communication refers to the use of different types and media in the context of development. It is also used to mean sharing of information and experience to accelerate development. Whereas development refers to the change of society for betterment. It can be both social and economic change for improvement or progress.

Development communication thus can be said to have two primary roles, i.e., (a) transforming role, as it seeks social changes for a higher quality of life. (b) Socializing role, by seeking to maintain some of the established values of the society. The role can be discussed as following:

A. Development communication is used for transforming role by bringing in social change in a way that will bring a higher quality of life. Here communication acts as an instrument to achieve these objectives.

B. Development communication also tries to maintain the established values of the society by playing a socializing role. In playing these roles, development communication seeks to create an atmosphere for change as well as providing innovation through which society may change. Development communication process is however successful only with the presence of a few key elements in the approach. These are: It should be responsive, should wing on feedback, should be innovative and creative, should be sustainable and continuous, independent validation.

Use of technology in Development Communication

Mass media and technology should be extensively and tactfully used for development purpose. It should be kept in mind that it is a weapon in

the hands of the government for positive developmental purpose. When the media is used for developmental purpose, develop communicator has to keep in mind that the usage should be extensive. And for this purpose the mass media structure should be planned and efforts should be made to reach out to maximum number of people every time. Daniel Lerner in 1958, while discussing the relation of development with that of any mass media said that: ―the greater the communication facilities, the greater or even faster is modernization.‖ According to Wilbur Schramm, the role of media in development can be divided into three parts i.e. (i) to inform (ii) to instruct and (iii) to participate. To inform: for the development of the society, correct social, political and economic influence is the main criteria. This information should be both national and international. People should be aware of the areas or facts which hamper the development process. To instruct: Mass literacy is an essential criteria to development. This is possible by imbibing basic skills among the people. Mass media plays an important role in this. Mass media can instruct people and educate them. Projects like Educational Television and Gyan Darshan are few such examples where media is used to instruct people, educate them and teach them basic skills. These basic skills help people to develop their standard of living.

The term Development is heavily loaded with different conceptions and a richness of uses and functions shaped by their various theoretical foundations. The term development for communication can be defined as "It is a process through which a society is expected to achieve certain **socio-economic**, **political**, cultural and other goals".

Todar and Smith \ identified three objectives of development as follows:

- To increase the availability and widen the distribution of basic life sustaining goods such as food, shelter, health and protection.
- To raise levels of living in addition to higher incomes, the provision of more jobs, better education, and greater attention to cultural and human values, all of which will serve not only enhance material well-being but also to generate greater individual and national self-esteem.
- To expand the range of economic and social choices available to individuals and nations by freeing them from servitude and dependence, not only in relation to other people and nation-states but also to the forces of ignorance and human misery.

The Philosophy of DSC

- The latest efforts undertaken to bring about a change in a limited area.
- It emerged as a more specific and participatory communication effort to educate the people of rural settings.
- It aims at targeting the audience to achieve a specific and defined goal of change and development.
- It does not depend on technological based communication media.
- It works within a limited **community** to create awareness about innovations.
- Its **philosophy** is to motivate the intended audience towards change using all available means of communication.
- It interacts more closely.

Development Communication Paradigms

Dominant paradigm of development

The dominant paradigm of development came into being in the 1960s based on the idea of modernization (industrial revolution, capital-intensive technology, **economic growth** and quantification per capita income index). Change agents of interpersonal system, together with the multiplying mass media are the twin pillars of the dominant paradigm, to introduce new ideas and practice in a given social system. Communication in the Dominant **Paradigm** became the crucial instrument of the directed **social change** [12] initiated and instigated by outsiders representing programmes of planned change.

It is the strategy of communication which flows from top to down. Development planner at the "Top" and relay "down" by technical assistance, intermediaries through government's beneficiary for implementation by using mass media and interpersonal communication. The powerful effect characterization is known as "hypodermic needle" theory; the "bullet and mechanistic S-R Theory" has largely been assumed in the dominant paradigm.

The paradigm puts heavy emphasis on

- Investments in the "Modern" sector with the hope that it would trickle down the advantages to the traditional setting.
- The existence of a free enterprise system giving transnational corporations to access to both raw materials and sale on the commercial market.

- Importation of advanced capital intensive technology by the **developing countries**.
- Stimulation of saving by preserving income gaps, particularly in the developing countries, the assumption that equalization leads to less savings(= less money for investment).
- Development aid in the form of loans, gifts technical assistance, and trained personnel.

Alternative paradigm

The alternative paradigm evolved during 1960s and 1970s due the critical reasons like capital world order, unequal distribution, stress on economic development and top-down communication. Under the dominant paradigm social and **economic development** imposed upon the third world countries, resulted in an alienation of people from their original and natural potentials. Consequently the third world countries started thinking for the proper utilization of all their energies, the manpower delineation of human being, restoration of dignity, self-respect and faith in one's own capabilities.

This trend led social and economic scientist of the third world to search a new model or paradigm for development that can work proper. Then the idea of alternative paradigm emerged in concept of development. China, Tanzania and Cuba gave this idea on the basis of some international events and issues world oil crisis, realization of third world and relations with china.

Alternative paradigm is based upon these points:

- It is the strategy of communication which flows from down to top meaning starting from the grass root level.
- Use of local natural resources usefully.
- Use of human resources usefully and making few alternative opportunity of work power into appropriate labor.
- Use of existing knowledge and dissemination of mass education in society or in whole country.
- Spreading the innovations (new technology) equally to everyone.
- Increasing more jobs opportunities in rural areas.
- Promotion of idea of cooperation, "let's work together".

- Equal distribution of wealth, education, technology, health facilities by closing the gap between haves and have-nots.
- Make the society homogeneous (social, cultural and economic).
- Making small groups of community and giving them tasks to complete.
- Focusing on integration of modern system with traditional, social, **cultural values** (marriage of traditional system with modern one).
- Involvement of every person of society in making policies and planning their own system for development and betterment.
- Equal use of media for all segments in society.
- Systematic network of Interpersonal communication.
- Involvement of opinion leaders.
- Dissemination of innovative messages.
- Use of traditional media especially radio.

DSC and change

The concept of change is positive in character which leads and motivates **human beings** towards better living conditions. Change process may occur at various levels and in different form. It may be termed as a change in people's physical structure, change in technology, social organization, normative values, **demographic** characteristics, agriculture, health and education etc. To our specific purpose, levels of change are summarized as:

Urbanization: The condition of being urbanized – it refers to increasing number of people that live in urban area.

Industrialization: The development of industry on an extensive scale – The process in which a society or country (or world) transforms itself from a primarily agricultural society into one based on the manufacturing of goods and services.

Modernization: Making modern in appearance or behavior – to accept or adopt modern ways, ideas or styles.

In DSC context, sources of change are integral to the nature and importance of an intended change.

Sources of change

Land: A basic source of change, particularly in an agriculture community.

Work Force: Human beings-their intentions, interests and abilities.

Capital: Its availability, procurement and proper utilization.

No change strategy can accomplish its goals without financial support which obviously needs capital.

Education: Leads a community towards awareness of what to do, what to accept and what to reject or modify. Change efforts can hardly succeed without educating the target society / community.

Opinion leaders: Such as social workers, local religious leaders (Imams in our society), school teachers etc.

Media Channels: Especially **interpersonal communication** in village settings.

Professionals: Professionals are associated with institutionalized arrangements for carrying on change actions. They may be attached with different social communities' agencies, such as health and family planning programs. They may also be communication experts.

Transport facilities: An important source of change in any community / society. Road, railways and other means of **transportation** link the change and reach the target areas. As change need flow of goods, ideas and essential mobility of human beings.

Government: Its structure, leadership, direction, planning and ability to execute the change projects.

Socio-cultural Values, belief system: In any change process, these components play decisive role of accepting and accommodating new ideas and things, of rejecting or resisting anything coming from outside.

But many campaigns and projects of DSC and change have been failed because assumptions were made about the willingness and capacity of people to absorb new technology and development infrastructures into their way of living and working. In third world countries especially in Pakistan DSC programs are facing some other obstacle in successful DSC.

As philosophy behind DSC is to formulate and apply communication strategies specifically designed for concrete development program. It is generally used in micro situations. Concepts such as diffusion of innovations, two-step-flow and change agents are more easily operationalized under DSC.

Problems in successful DSC program

- Lack of Finance
- Lack of self-reliance in terms of money

- Misuse of funds
- Lack of planning
- Lack of investment
- Lack of education
- Lack of professional training
- Lack of use of modern communication means
- Lack of use of modern transportation
- Control over media
- Lack of government interest
- Administrative problems
- Lack of highly educated & skilled people
- Socio-cultural problems (diversities in language, customs, traditions and religions)
- Lack of youth & female participation
- Corruption
- Poverty
- Foreign pressure
- Wrong planning
- Lack of involvement of local people
- Lack of foreign investment
- Lack of cultural imperialism
- High rate of population growth
- Lack of use of natural resources
- Misleading identification of the problems
- Self-interest of **bureaucracy**
- Messy infrastructure of national institutions
- Lack of media guidance
- Lack of youth development programs.
- Lack of political & provincial integration
- Lack of DSC awareness

Development communication is characterized by conceptual flexibility and diversity of communication techniques used to address the problem. Some approaches in the "tool kit" of the field include:

information dissemination and education, behavior change, social marketing, social **mobilization**, media advocacy, communication for social change [11], and participatory development communication.

To bring about change and to overcome the problems in DSC, there is a solution of community participation on the basis of which real change can occur which will base on the needs and demands of public.

Participatory Approach

The reaction against modernization (and to some extent the realization of global structural imbalances) gave birth to participatory approach basis on actively involving people who were the "subjects" of development in happening of the process.

The roots of participatory approaches in development communication can be found in the early years of the 1970s when many people in the development community began to question the top-down approach of development dominant in the 1950s and 60s which had targeted the economic growth of countries as its main goal. During these two decades the success of the developed countries was held-up as the model to aspire to. Development was thought to be triggered by the wide-scale diffusion and adoption of modern technologies. Such **modernization** was planned in the national capitals under the guidance and direction of experts brought-in from developed countries. The overall approach to modernizing the developing world eventually ran into problems. It was realized that development was not restricted to just building roads, piping water, and distributing electricity. Nor was it limited to neither increasing farm yields per hectare nor switching **farmers** over to cash crops.

Over-riding the alien information communicated to the people was a bigger problem. Because the development had been centrally planned without any consultation with people, wrong solutions were often pumped down to startled communities. The expensive failures of the top-down, mechanistic approach were noticed in the cities. Activists began to loudly criticize them as focused on the symptoms, not root causes of poverty. They were appalled by the arrogant top-down communication which fractured fragile developing communities by under-mining indigenous knowledge, beliefs and social systems. They were also furious with development plans which catered more to the interests of the city elites than the people in the **villages**.

Interpersonal Communication

Just as during the modernization era, communicators responded to the shift towards participation in development by echoing the new approaches. To compound the challenge, much of the seminal thinking ha d focused on interpersonal processes. Also, for the first time development communication was no longer in the exclusive domain of the professionals. Participatory communication, in the ideal situation, is practiced spontaneously by the people without mediation. It was ideally the by-product of participatory processes and participatory communities.

The emphasis on interpersonal and **traditional methods** encouraged the development and use of these communication methods which had been largely ignored until then. Street theatre, folk-songs, speech, and group activities became important and effective channels for participatory communication. Large scale national communication activities were set aside in favor of small, localized and intimate programs.

The stress on **interpersonal** approaches at first suggested a small-scale, community -based approach to participatory communication. Speech, traditional and folk media, and group activities were considered the most appropriate instruments for supporting the approach. Community radio scored some of the early successes. The large, centralized model of the city-based station was replaced by small operations broadcasting on low-power transmitters owned by trade unions, churches and other communities. The people produced and voiced the programs which were focused on local issues which were the most current and important to them. Such innovations made way for participatory communication to be practiced at both the community or village level and at the broader regional or sub-regional level. According to Uphoff cited in people of the community can be involved in development in four ways:

Participation in implementation: People should actively encourage and mobilized to take part in the actualization of projects. They should give certain responsibilities and set certain tasks or required to contribute specified resources.

Participation in evaluation: Upon completion of a project, people should invite to critique the success or failure of it.

Participation in benefit: People should take part in enjoying the fruits of a project, this maybe water from a hand-pump, medical care by a "bare-foot doctor", a truck to transport produce to market, or village meetings in the new community hall.

Participation in decision-making: People initiate, discuss, conceptualize and plan activities they will all do as a community. Some of this may be related to more common development areas such as building schools or applying for land tenure. Others may be more political, such as removing corrupt officials, supporting parliamentary candidates, or resisting pressures from the elites. Yet others may be cultural or religious in nature--organizing a traditional feast, prayers for an end to the drought, and a big party just to have a good time. In all matters people living in any community should have proper rights to participate in decision making.

Planning DSC campaign

Planning is supposed to be a prerequisite of any programme. In case of Development Support Communication (DSC) and community participation, appropriate planning is the primary step for achieving the goals. DSC campaign: it is an integrated manner that utilizes different educational and communication methods, aimed at focusing attention on a particular problem and its solution over a period of time.

Creating the plan

There are three stages of any DSC Campaign plan.

Stage 1: Identification of objectives

Stage 2: Analysis (analysis of a problem, target audience, situation & sponsor)

Stage 3: Formulation of the plan (selection of the suitable method, timing the campaign, using slogans and symbols, pretesting the messages, providing channels for information seeking & involving people).

Keeping in view the importance and workability of community participation, community media can play a vital role to reduce and eradicate the problems and issues in DSC. Certain methodology for activating the community media can brighten the pave towards success if the focus is on these points.

Identification of needs by means of direct contacts with the groups

- Concretization: examination of the problem identified by the groups in the light of local conditions;
- Selection of priority problems by the groups;

- Formulation of a durable methodology for seeking solutions;
- Identification of the amount of information required and access to this information;
- Action: execution by the groups of the projects they have designed;
- Expansion toward the outside to make known the points of view of the groups to other groups or to the authorities;
- Liaison with the communication system to make known their action.

Using Mass Media for DSC

Although interpersonal communication is the main tool of DSC operation, however, personal or face-to-face methods cannot reach everyone who wants and needs information. So following mass media methods are used to reach large numbers of people quickly.

- **Print media** (newspapers, wall newspapers, blackboard news, newsletters, folders, leaflets, pamphlets, and factsheets)
- Audio visual media (radio, audio cassette, TV, pictures, slides, film strips, overhead transparencies & audio visual recorder)
- Static media (posters, exhibits and displays)
- Emerging technology (communication satellites, telephones, video conferences, FM radios, 3D graphics, multimedia projectors, CDs, DVDs, **Mobile phones** and mother of all "the computer & **internet**")

These methods are particularly useful in making large number of people aware of new ideas and practices, or alerting them to sudden emergencies. While the amount of detailed information that can be transmitted by **mass media** is limited, they will serve an important and valuable function in stimulating target audience interest in new ideas. Once stimulated or made aware through mass media, **audiences** will seek additional information from neighbors, friends, extension workers or progressive audiences in the area.

Media Forum

The overall objective of this event is to contribute to the ongoing international debate about the importance of media and information and communication technologies for peace and sustainable development and to work for the inclusion of a goal acknowledging this in the post-2015 development agenda. More than 300 media practitioners,

academics, government officials, civil society organizations and media owners will participate in the Global Media Forum.

As stated in the UNESCO International Conference celebrated to commemorate the World Press Freedom Day in 5-6 May 2014 in Paris, freedom of expression and its corollary of press freedom and freedom of information are both fundamental rights as well as enablers of many goals relevant to the post-2015 Development Agenda. These include good governance, transparency and access to information, empowerment of women and youth, ending poverty, sustainable development and ensuring stable and peaceful societies.

Key themes to be addressed during the Global Media Forum are

- The role of media and the relevance of freedom of expression in human and social development.
- Empowering people, including marginalized groups, through media and information literacy and access to information.
- Facilitating good and effective governance through media.
- The role of media in promoting peace, tolerance, and the dialogue among civilizations, cultures, people and religions.
- Social media to enhance youth participation and civic engagement.
- Gender Equality and media.
- Safety of journalists as a precondition for freedom of speech and good governance.
- Ethics and professional standards in media in the era of internet and social media.
- Assessing the media landscape in Indonesia

Bali Road map for Media and Development

The Global Media Forum will adopt the Bali Roadmap for Media and Development, which will include recommendations on both media development and media for development. Both perspectives must be included in the coming Sustainable Development Goals. The Forum will document how human and social development is relying also on unhindered access to information and knowledge and free media.

Chapter-4

PROGRAMMED LEARNING; THEORETICAL CONSIDERATIONS

4.1 PROGRAMED LEARNING: THEORETICAL CONSIDERATIONS

Programmed learning, educational technique characterized by self-paced, self-administered instruction presented in logical sequence and with much repetition of concepts. Programmed learning received its major impetus from the work done in the mid-1950s by the American behavioral psychologist B.F. Skinner and is based on the theory that learning in many areas is best accomplished by small, incremental steps with immediate reinforcement, or reward, for the learner. This technique can be applied through texts, so-called teaching machines, and computer-assisted-instruction. No matter what the medium, two basic types of programming are used: linear, or straight-line programming, and branching programming.Linear programming immediately reinforces student responses that approach the learning goal. Responses that do not lead toward the goal go unreinforced. Each bit of learning is presented in a "frame," and a student who has made a correct response proceeds to the next frame. All students work through the same sequence, and a low rate of error is necessary to ensure continued positive reinforcement of correct responses.

Branching, or intrinsic, programming, was initially developed in conjunction with the use of an electronic training device for military personnel. This technique provides the student a piece of information, presents a situation requiring a multiple choice or recognition response, and on the basis of that choice instructs the student to proceed to another frame, where the student or the student learns if the choice was correct, and if not, why not. A student who responded incorrectly will either

be returned to the original frame, or routed through a subprogram designed to remedy the deficiency indicated by the wrong choice. A student who selects correctly advances to the next frame in the program. This process is repeated at each step throughout the program, and a student may be exposed to differing amounts of material depending upon errors made.

Text materials often rely on a cardboard mask that the student uses to cover the correct response until a choice is made. There are successful programmed-learning texts for primary-grade pupils, but most such texts have been designed for upper-grade and college-level subjects such as statistics, economics, and foreign languages.

Originally introduced in the mid-1950s by behaviorist B.F. Skinner, programmed instruction is a system whereby the learner uses specially prepared books or equipment to learn without a teacher. It was intended to free teachers from burdensome drills and repetitive problem-solving inherent in teaching basic academic subjects like spelling, arithmetic, and reading. Skinner based his ideas on the principle of **operant conditioning**, which theorized that learning takes place when a reinforcing stimulus is presented to reward a correct response. In early programmed instruction, students punched answers to simple math problems into a type of keyboard. If the answer was correct, the machine would advance to another problem. Incorrect answers would not advance. Skinner believed such learning could, in fact, be superior to traditional teacher-based instruction because children were rewarded immediately and individually for correct answers rather than waiting for a teacher to correct written answers or respond verbally. Programmed instruction quickly became popular and spawned much educational research and commercial enterprise in the production of programmed instructional materials. It is considered the antecedent of modern computer-assisted learning.

4.2 TYPES AND MECHANICS/STEPS OF PROGRAMMING

All programming involves creating something that solves a problem. The problems can range from something of great scientific or national importance, through to something as trivial as relieving personal boredom. This section describes one approach to solving such problems - think of it as a rough guide to the things the teacher should do when entering the land of programming.

In broad terms, those things are:

1. Identify the Problem
2. Design a Solution
3. Write the Program
4. Check the Solution

Of these, only the third step is usually called “programming”, but as you’ll see later, it’s probably the least important stage of the process.

Identify the Problem

In fact, this stage should really be called identifying the solution because what you’re really trying to do is to tie down exactly what it is that you’re trying achieve.

There are two stages to identifying a solution:

- Requirements
- Specification

Requirements

The first step is to examine the problem carefully to try to identify what qualifies as a solution. A single problem may have many different solutions, but they will all have something in common. So here you’re trying to work out exactly what your program will be required to do.

Specification

The second step is to then look at the list of requirements and to decide exactly what your solution should do to fulfil them. As the teacher mentioned above, there are usually many different solutions to a single problem; here, your aim is to decide on which of those solutions the teacher want. Therefore, you’re trying to specify, in a fairly accurate manner, just what it is your final program will do.

Working out a design to fulfil a particular specification can be difficult for several reasons:

1. You may need to learn a bit more about the capabilities of your computer and your chosen programming language/environment to see what things it makes easy or difficult.

2. You may also need to learn some extra information about the problem or find a technique to solve it before the teacher can work out how to build the program.
3. Finally, the teacher may be able to think of several ways to build the program, but they will all have different strengths and weaknesses and so some choices will have to be made.

Program

Programming is then the task of describing your design to the computer: teaching it your way of solving the problem.

There are usually three stages to writing a program:

1. Coding
2. Compiling
3. Debugging

Coding

Coding is the act of translating the design into an actual program, written in some form of programming language. This is the step where the teacher actually have to sit down at the computer and type. Coding is a little bit like writing an essay (but don't let that put off). In most cases the teacher write your program using something a bit like a word processor. And, like essays, there are certain things that the teacher always need to to include in your program (a bit like titles, contents pages, introductions, references etc.). But we'll come on to them later. When you've finished translating your design into a program (usually filling in lots of details in the process) the teacher need to submit it to the computer to see what it makes of it.

Ompiling

Compilation is actually the process of turning the program written in some programming language into the instructions made up of 0's and 1's that the computer can actually follow. This is necessary because the chip that makes your computer work only understands binary machine code - something that most humans would have a great deal of trouble using since it looks something like:

01110110
01101101

10101111
00110000
00010101

Early programmers actually used to write their programs in that sort of a style - but luckily they soon learnt how to create programs that could take something written in a more understandable language and translate it into this gobbledy gook. These programs are called compilers and the teacher can think of them simply as translators that can read a programming language, translate it and write out the corresponding machine code. Compilers are notoriously pedantic though - if the teacher don't write very correct programs, they will complain. Think of them as the strictest sort of English teacher, who picks the teacher up on every single missing comma, misplaced apostrophe and grammatical error.

Debugging

This is where debugging makes it first appearance, since once the compiler has looked at your program it is likely to come back to the teacher with a list of mistakes as long as your arm. Don't worry though, as this is perfectly normal - even the most experienced programmers make blunders. Debugging is simply the task of looking at the original program, identifying the mistakes, correcting the code and recompiling it. This cycle of code -> compile -> debug will often be repeated many many times before the compiler is happy with it. Luckily, the compiler never ever gets cross during this process - the programmer on the other hand... It should also be said at this point that it isn't actually necessary to write the entire program before the teacher start to compile and debug it. In most cases it is better to write a small section of the code first, get that to work, and then move on to the next stage. This reduces the amount of code that needs to be debugged each time and generally creates a good feeling of "getting there" as each section is completed.

1.5. PROGRAMMED LEARNING/INSTRUCTION: SOME APPLICATIONS

The goal of early developers of programmed instruction was to design the instructional activities to minimize the probability of an incorrect response (Beck, 1959). However, much has been made of the distinction between what some have called Crowder's (1960) multiple-choice

branching versus Skinner's linear-type program. Crowder, like Skinner (1954, 1958a) likens his intrinsic system to a private tutor. Although Crowder himself claimed no theoretical roots, his method of intrinsic programming or "branching," was developed out of his experience as a wartime instructor for the Air Force. In a sense they were talking about two very different things. Skinner was writing about education and Crowder was writing from his experience in the teaching complex skills to adults with widely varying backgrounds and abilities. The issue is informative, however. Neither man wanted errors per se.

Linear sequences / linear programme

The credit of linear programming style goes to B. F. Skinner. Linear programming style is related to "operant conditioning". Operant conditioning states that human behavior is shaped through suitable reinforcement to the responses. It tells that "A Certain direction can be given to human behavior", for this purpose activities is needed to divide in small parts and make their analysis. It is a gradual process and the responses are conditioned in a step by step manner.In a linear programme, learner's responses are controlled externally by the programmer sitting at a distant place. A linear programme is called a straight line programme as the learner starts from his initial behaviour to the terminal behaviour following a straight line. The student proceeds from one frame to the next until the student completes the programme.

Characteristics of linear programme

- Linear are exposed to small amount of information and proceed from one frame to one item of information, to the next in an orderly fashion.
- Linear responds overtly that their correct responses can be rewarded and heir incorrect responses can be corrected.
- Linear are informed immediately about whether or not their response is correct (feedback).
- Linear proceed at their own pace (self-pacing).

Features of Linear programme

1. Linear means proceeding in a straight line. In linear programme generally, information is broken into small steps of 40-50 words in length which is called a frame. The learner must respond to each frame in succession by filling in word or phrase in a blank.
2. Linear Arrangement: In such type of programme, the learner advances in a single series of shorts steps which are designed to ensure high rate of correct responding to the questions (frames). Same path is followed by each learner. The learner starts from initial behaviour to the terminal behaviour following straight-line sequence. All learners pass through the same path.
3. Responses are controlled. In a linear programme, responses are controlled by the programmer. The responses and their order are fixed. The learner has no choice to respond in his own way.
4. Response is emphasized. In linear programme, the emphasis is laid on response. The learner must respond to each and every in order the learning to occur.
5. Feedback is quick. As soon a s the learner responds to the frame he can immediately compare his response with the response f the programme. Learners are informed immediately about whether or not their response is correct
6. Provision for prompt. In the beginning, prompt or cue can be supplied to facilitate learning too occur.
7. Cheating is discouraged by not revealing the answer to the learner.
8. Learners proceed at their own pace. Learner can skip certain frames.
9. Responses are self-constructed. Learners respond overtly so that their correct responses can be rewarded and their incorrect responses can be corrected

Fundamental Principles of Linear Programming

Linear programming is based on five fundamental principles-

1. Principles of small step.
2. Principle of Active responding
3. Principle of immediate confirmation.
4. Principle of self-pacing.
5. Principle of student testing.

In this type of sequencing all students read and respond to the same frames. The sequence is linear in that there is a single line or

path for all students to follow. While programming in linear way the information is broken down in pieces of related information and then they are sequenced into meaningful steps. The information which is to written in the steps is planned out. The information should be so written that it should be linked to the information in the next step. The learner has to respond to each step actively and the reinforcement is given immediately. The reinforcement depends on the correctness of the responses given by the learner. If the response is correct a positive reinforcement is given, motivating the learner to attempt more responses which will be positively reinforced

A pictorial representation an example of linear programming

Each square represents a frame. The student proceeds from one frame to the next until the student completes the program. Most linear sequences use the constructed (or fill-in) response.. Many new programs, however, use both constructed and multiple-choice responses. Although most linear sequences use shorter frames than those used by the branching sequences the teachers describe below, the single-sentence or short frame is not an essential characteristic of linear sequences. Markle (1964) developed a linear sequence on programming which contained frames which were paragraphs or longer in length. Even the major characteristic of linear sequences—the use of the single path—is no longer rigidly prescribed.

Lysaught and Williams (1963) show many ways in which a linear sequence can be modified into a multi path program. An interesting variation is the linear sequence with criterion frames. These frames test entering behavior at various points in the program to determine whether the students should go through the sequence of frames which follows. If this is not necessary, the student is directed to a sub sequence, which will move him quickly to an advanced point in the program.

Advantage of Linear Programming

- The assumption behind the linear programming is students learns better if content is presented in small units, students response if immediately confirmed, results in better learning, Student's error create hindrance in learning, Student learns better in Laissez fairy environment.
- Frame size in small steps; include only one element of topic at a time. Each step is complete in itself. It can be taught independently and can be measured independently. Frame structure is based on stimulus-Response-reinforcement. There are four types of frames. Introductory frames, Teaching frame, practice frames and testing frames.
- Responses in linear programming are structured responses and these are controlled by programmer and not by learners. Immediate confirmation of correct responses provide reinforcement, wrong responses are ignored.
- It is used for secondary level students, used for achieving lower objectives of learning especially for recall and recognition, useful for student of average and below average intelligence can be used in Distance education program.

Limitations of Linear programming

1. **Lack of motivation:** It is alleged that learning becomes dull and learner experiences monotony and boredom. It takes too much time to teach a few points.
2. **Freedom of choice is curtailed**: The learner has no choice of his own to respond, thus its alleged that creative imagination of learner is inhibited.
3. **Costly:** It has been found that preparation of programmed material requires too much paper and time.
4. **Blanks and key terms are guessed:** Rothkopf is of the opinion that in many programmes, the learners find out the cues as to what is to be filled in blanks and key terms are guessed
5. **It can be used in limited areas:** Where the behaviour is measurable and observable such as Maths and science.
6. **Searching of material is not permitted:** as in a textbook. Judgmental learning is not practiced.
7. **Does not permit differentiation among responses:** No freedom for student to response.

   Students follow a rigid line prescribed by the programmers: Every learner has to follow the same path; therefore, student may cheat from one another.
8. **It is very difficult to find out exactly the background of each learner** : Programmes are generally designed with a view that learner has no previous background of the subject matter..

9. **In book form presentation**: learners are expected to be honest but from all learners the teacher cannot expect honesty. They can see the correct response without reading the frames.
10. **Based on learning theories which were formulated by experience conducted on animals**. A human being is more intelligent, than animals, he has got an intelligent brain.
11. **Wrong responses are avoided in the program:** No remedy is provided for them.
12. **Branching Sequences / Branching Programming**

    The founder of Branching programming is Norman A Crowder, hence it is also known as Crowderian Model. It is based on configuration theory of learning. It is a problem solving approach. It is stimulus centered approach of learning. As the word "branching" means the subdivision the stem or trunk. The same concept is applied in the branched programming instruction style.

The main concept (the trunk of the tree) is sub divided into smaller concepts (the stems of the tree) and further again to other minute details of the topic. Norman A Crowder has given its definition as —It is a programme which adapts to the needs of the students without the medium of extrinsic device as a computer.‖ It is called intrinsic because the learner within himself makes the decision, to adapt the Learning to his/her needs. The rationale of intrinsic programming postulates that the basic learning takes place during the student's exposure to the new material on each page. In branching programme, the learning material is divided into "units' of material called "frames'. Much information, one or two paragraphs or even a page, is provided in a frame. Thus each frame is quite larger than that employed in linear programme. The learner goes through the frame. After that the student is required to respond to multiple choice questions associate with the learning material of the frame.

The learner moves forward if the student answers correctly but is diverted (branched) to one or more remedial frames if the student does not. These frames explain the matter afresh, ask him questions to elicit the right answer and reveal his previous mistakes, and then return him to original frame. This cycle goes on till the learner passes through the whole instructional material at his own pace.

Each Content frame includes the following:

- Repeating student response
- Positive confirmation
- New information'
- Question
- Alternatives followed by page numbers, where the student should go next.

Each Remedial frame includes the following :

- Repeating student response
- Negative confirmation
- Reasons why the student is wrong
- Further explanation in simple language
- Directions as to where the student should go next.

Features of Branching programme

1. Material in a frame is larger; much information is presented at each step. A step may consist of two or more paragraphs and sometimes a full page.
2. The method of student response is different than that of linear model; student has to make choice out of several choices. Multiple-choice question are asked. Each response to the question is keyed to different pages. If the learner selects correct response, his response is confirmed and in case the student selects wrong response, then the student routed to material which explains as to why the student is wrong.
3. Crowder holds that teaching is communication and so the student concentrates his attention upon the improvement of communication.
4. Learner has freedom to choose his own path of action according to the background of subject matter. The learner controls the exact sequence that the student will follow.
5. The programmer has ample opportunity to exploit the literary style.
6. Student is more alert and concentrates on the subject matter more carefully.
7. Detection and concentration of errors is important. Crowder holds that making error is basic to learning. the student permits 20 percent

errors in his model. In such a model first the errors are detected and then corrected. The learner knows why the student is wrong. Crowder says that it is impractical to eliminate errors in the process of learning.

8. The crucial and identifying feature of branching model is the fact that the material presented to each student is continuously and directly controlled by the learner's performance in answering questions.
9. Intrinsic programmed material when presented in a book form, the book is called scrambled book because the pages do not follow in a normal sequence.
10. It is very useful to concept learning or where the material is given one larger steps.
11. The role of active response is not central in intrinsic theory. Intrinsic programme offer less guidance to learner as to what material in the frame is important.

Fundamental Principles of Branching Programming

1. Principle of Exposition
2. Principle of Diagnosis
3. Principle of remediation.

Branching programmed learning is similar to linear programmed learning except that it is more complicated because it attempts to diagnose the learner's response. It usually involves a multi-choice format: After the learners have been presented a certain amount of information, they are given a multiple-choice question. If they answer correctly they branch to the next body of information. If they are incorrect, they are directed to additional information, depending on the mistake they made. Many CBT training courses are based on the concept of linear or branching programmed learning.

The best known branching technique is called intrinsic programming. Its major characteristics are:

- Frame size is large.
- There may be a Para or page in the frame.
- It consists of rather long frames which often appear as pages in an ordinary textbook.

- The student reads the page (or frame) and then responds by selecting the correct alternative in a three-alternative multiple-choice item.
- Each alternative is associated with a page number which directs the students to another frame.
- Frame structure is Exposition.

  Responses not rigidly structured and responses are selected by learner and not by the programmer. Confirmation of correct responses provides reinforcement. Wrong responses also help in diagnosis of weaknesses of the learner. Remedy is provided on the basis of diagnosed weaknesses of the learner. Remedy is provided on the basis of diagnosed weaknesses. Error helps in diagnosis of the weaknesses of learner. More than 20% error rate can be accepted. The purpose of Branching programming is to draw out weak points of learner and provide remedy for recovering those weaknesses.

Branching programming is used for secondary as well as higher classes. Higher objectives can be achieved such as multiple discrimination etc. It is useful for students of above average and high intelligence. It can also be used in Distance education programs. **The advantages of branched programming instructions are as follows –** Assumption behind this programming is that a student learns better if the student is exposed to whole situation or content. Student errors help in diagnosis. Student learns better if remediation is provided side by side. A Student learns better in democratic environment.

- In this format the student proceeds to the next frame until the student makes an error. The errors branch him to supplementary material designed to give him remedial instruction
- The center of the teaching – learning process is the learner and not the facilitator or the instructor.
- The learner learns with his or her own speed and pace.
- Much of the learning takes place when freedom is give to the learners. In branched programming style freedom is given to the learners so that they can learn at their own pace.
- Learning is done when the new concepts are revised. The learner gets an opportunity to travel to and fro in the newly learnt content. If the responses given by the learner are not up to the mark, the

learner can start learning the content from which the student or the student has not understood. The correct responses are appreciated there by internally motivating the learner to grasp the content till the end.

Limitations of Branching programming

1. The learner may guess the correct response without understanding the subject matter of the frame.
2. Infinite branching cannot be provided. It cannot cater to the needs of the individuals. It is very difficult to find out the total number of branches for each individual.
3. Cost of preparation is high, audio-visual equipment is costly.
4. The programme needs revision after every two years which is a very costly affair.
5. Programmes are the product of programmer‘s imagination and it is the student who decides diagnostic questions and level of content.
6. Branching model can be used after sixth grade the grade because small children do not follow its mechanism.
7. It is very difficult to ask questions on the whole matter of the frames because the frames are too large and sometimes important subject matter is left.
8. It does not consider learning process whether learning is taking place or not. Main emphasis is on diagnosing the weakness of learners and providing remedy to them.
9. There is no sequencing of pages. Student finds it difficult to follow the steps. the student does not find it exciting or motivating, therefore the student does not want to go through these pages.
10. More emphasis on remediation rather than teaching. Hence, it is only a tutorial approach.

Linear Versus Branching Systems

The matter or the concept is placed in a logical sequence in both the programming methods. The difference is the simplicity of the presentations of the matter. In linear programming the subject matter is presented in a straightforward and uncomplicated form. It follows a certain direction. Whereas the branched programming follows a

complicated format, which does not follow a definite direction, it is like a scrambled book where the pages do not follow the normal sequence. As the linear programming the subject matter is presented in a straightforward and uncomplicated format it is used for fixing of learning and generally meant for the lower classes. But this is not in the case with branched programming. The subject matter is in complicated format generally meant for higher class students.

The goal of early developers of programmed instruction was to design the instructional activities to minimize the probability of an incorrect response. However, much has been made of the distinction between what some have called Crowder’s (1960) multiple-choice branching versus Skinner’s linear-type program. Crowder, like Skinner (1954, 1958a) likens his intrinsic system to a private tutor. Although Crowder himself claimed no theoretical roots, his method of intrinsic programming or “branching,” was developed out of his experience as a wartime instructor for the Air Force. Crowder’s method used the errors made by the recruits to send them into a different, remedial path or branch of the programming materials. Although the remediation was not in any way based on any sort of analysis of the error patterns or “procedural bugs.” it may well have been the first use of errors in a tutorial system.

Although much has been made about the differences between Skinner and Crowder, it is clear that although the two men worked independently, Skinner was clearly aware of the use of branching and accepted it. Crowder began publishing his work a year later in 1959. In a sense they were talking about two very different things. Skinner was writing about education and Crowder was writing from his experience in the teaching complex skills to adults with widely varying backgrounds and abilities. Certainly no one would propose to write materials systematically designed to lead the student into errors and anyone would prefer programs in which no student made an error if this could be achieved.

1.6 DIFFERENCE BETWEEN PLM AND OTHER INDIVIDUALIZED INSTRUCTIONAL TECHNIQUES

In a typical classroom, you’ll find students who are reading above their grade level and others who are behind. the teacher might find that some learn best by working with other kids, while others prefer

working alone. And some students need special help along the way to fill in areas where they struggle.

The best teachers reach all their students by giving the whole class a great experience. But they change up the material a bit for each student so everyone learns at their own pace.

Differentiated instruction is a teaching method for groups of students. **Individualized instruction** starts with the needs of the one student. Here's what the teacher need to know about both approaches.

Differentiated Instruction

Flexible groups are at the heart of differentiated instruction. The same students are not in the same group for every activity or assignment. Each student is moved around according to her abilities. Teachers design their lessons around the needs of each group. For example, one group might write a paragraph after listening to a reading, while another group puts on a skit. A third group might create a poster or an art project to show what they've learned. Students may read books on topics that are closely matched to their reading levels.

Individualized Instruction

Individualized instruction focuses on the needs of the individual student. Teaching is specific and targets one need at a time. This teaching method can be used on its own, or it can be part of differentiated teaching. Some students who receive individualized instruction need teachers to help them understand and learn. Other students using the same teaching method can skip topics they already know and go on to advanced information. Special education is a great example of individualized instruction. Students who receive special education services have an Individualized Education Program (IEP). Through an IEP, the school can meet their individual needs and provide accommodations just for them.

Learner-Controlled Instruction

In learner controlled instruction, the learner takes up the responsibility for his/her learning. It, however, does not mean that you, as a teacher, have no role to play in learner-controlled instruction. It is a matter of shifting relatively more of the responsibility of learning to the students. When the teacher say that in learner-controlled instruction the students assume the responsibility for his or her learning, the teacher

want to draw your attention toward the main attribute of this method. That is the emphasis here is on learning rather than teaching. Your role becomes more of a manager, a facilitator or a guide. Your help is essential throughout the instructional process. Learnercontrolled instruction includes a number of techniques which range from the simple assignment to the most sophisticated computer-assisted instruction. All learnercontrolled instructional techniques come under the umbrella of self-learning or individualised instruction. In the next section, the teacher discuss the concept and different forms of self-learning.

Self learning

Self-learning or individualised instruction developed when teaching methods meant for all members of a group failed to meet the varying needs of individual students. An underlying assumption in this method of instruction is that human-beings learn many things through their own efforts. Every individual has a natural desire to learn on hisher own. Another assumption is that every individual is unique; the student or the student learns according to his or her abilities. Hence, any teaching system based on presentation of information to a group cannot take into account the wide variation in the rates at which individual students learn. As the students entering secondary education vary in their abilities, interests and needs, there is a pressing need for a wide range of instructional alternatives which may cater to their individual differences. Individualized instruction is the only panacea for such needs. The most common description of self-learning methods is that teaching is directed towards individual students rather than the group of students. However, self-learning is not synonymous with independent learning or learning in isolation from other students. Self-learning may encourage independence from the teacher; this, however, is not usually the main aim. During self-learning, the students do not necessarily work in isolation from their peers. The main characteristics of self-learning are : -

- emphasis on learning rather than teaching
- recognition of individual differences
- active student participation
- working at one's own pacelself-pacing, and
- provision of feedback and evaluation.

Self-learning as a method of instruction has certain advantages which make it more suited to the students. They are:

- The students learn more effectively when they learn on their own. Self-learning develops critical thinking in handling of study materials on one's own and enhances communicative skills and self-reliance.
- Self-learning prepares the student to face the problems in hisher real life.
- Learning on one's own is more enjoyable, exciting and rewarding. 0 Self-learning promotes self-discipline in the students.

Programmed Instruction

Programmed instruction or programmed learning emerged out of the research conducted by BF. Skinner on operant conditioning (You will study about operant conditioning in detail in course ES-332). Although Skinner's name is always associated with programmed leaming. there were several efforts made earlier by some people In this direction. The Law of Effect propounded by EL. Thorndike (1874-1949) has direct relevance to programming. According to this law, learning which is associated with satisfaction is likely to be more permanent than learning not accompanied by misfaction. Satisfaction in the form of reward reinforces the behaviour of the student to ch interest in hidm learning. This is an important aspect in programming. In 1926, Sydney L. Pressey devised a teaching machine which required students to press keys to answer multiplechoice questions and the next question was presented only after the correct key had been pressed by the student The idea behind such a teirching machine was that after being exposed to instruction, the student would go through a test presented by a machine and achieve mastery on all the questions (content) till (s)he ceased making mistakes. The real landmark in the development of programmed learning was the work of B.E Skinner. After conducting extensive research on rats and pigeons, Skinner developed a theory of learning called operant conditioning. According to this theory, behaviour is leamed only when it is immediately reinforced, that is, when it is followed by some pleasurable event such as food, praise or attention. Therefore, the task of the programmer is to provide contingencies of reinforcement so that the correct responses to the questions presented

are immediately rewarded and the incorrect responses are not Skinner opposed punishment for wrong responses and recommended that punishment should be kept minimum so that there was no danger of developing a negative attitude towards the learning activity. By applying the principles of operant conditioning in teaching human-beings, Skinner developed an instructional model which is popularly known as programmed instruction. The term 'programmed' is used for arranging learning experiences or events in the most logical and psychological sequence so that the student gets maximum benefit Etom instruction. Having explained the origin and the concept of programmed instruction, the teacher now present so the teacher the various styles of programmed instruction. Styles of programmed instruction: There are mainly two styles of programmed instruction - linear and branching. These styles aim at programming of subject matter and are widely used in instructional situations all over the world. However, there is yet another style which is used for programming of behaviour. This style is called mathetics.

Linear style: The linear style of programming developed by BF. Skinner is otherwise known as Skinnerian style. According to this style, the subject matter is broken into small pieces of information (steps) and is presented in a logical sequence of small steps. These small steps are called frames. The student is required to go through frames containing a bit or bits of information and respond to the question given at the end of each £tame. The feedback in the form of correct answer is provided in the next £tame. The frames are so designed and arranged that students' errors are kept to a minimum. In other words, programmed instruction ensures that the student makedcommits minimum errors. An example of linear programming is presented through the following £tames.

Personalized System of Instruction

PSI is also known as the Keller plan. First described by Fred Keller in Good Bye Teacher - Journal of Applied Behavior Analysis (1968). It is composed of small self-paced modularized units of instructions where study guides direct learners through the modules. Unit tests are given on each module where the learners must show mastery by scoring at least a 90%. Student proctors are used to help with individual problems and lectures are given for motivational problems only. PSI combines mastery learning with principles of reinforcement learning

theory. Mastery learning requires that the desired student performance be stated precisely using performance or learning objectives.

The modules can consists of reading assignments, films, audio tapes, field trips, programmed instruction, conducting an experiment, conducting an interview, etc. The performance evaluations can be essays, multiple choice, oral exams, written report, etc. Although not required, bonus points are encouraged to be given to learners who complete the tests in a timely manner since procrastination in a self-paced course is the biggest problem.

Keller divided the process for creating PSI into four steps

- Determine the material to be covered in the course.
- Divide the material into self contained modules (segments).
- Create methods of evaluating the degree to which the learner has conquered the material in a given module.
- Allow learners to move from module to module at their own pace.

Chapter-5

COMPUTER IN EDUCATION

5.1 METHODS OF COMPUTER BASED INSTRUCTION: TUTORIALS, DRILL & PRACTICE AND INSTRUCTIONAL PACKAGES

Computer Assisted Instruction

Terminology

Use of computer in education is referred by many names such as

- Computer Assisted Instruction (CAI)
- Computer Aided Instruction (CAI)
- Computer Assisted Learning (CAL)
- Computer Based Education (CBE)
- Computer Based Instruction (CBI)
- Computer Enriched Instruction (CEI)
- Computer Managed Instruction (CMI)

New Terminology

- Web Based Training
- Web Based Learning
- Web Based Instruction

Computer-based education (CBE) and computer-based instruction (CBI) are the broadest terms and can refer to virtually any kind of computer use in educational settings. Computer-assisted instruction (CAI) Computer Aided Instruction (CAI) is a narrower term and most often refers to drill-and-practice, tutorial, or simulation activities. Computer-managed instruction (CMI) Computer-managed instruction is an instructional strategy whereby the computer is used to provide

learning objectives, learning resources, record keeping, progress tracking, and assessment of learner performance. Computer based tools and applications are used to assist the teacher or school administrator in the management of the learner and instructional process.

Computer Assisted Instruction (CAI)

A self-learning technique, usually offline/online, involving interaction of the student with programmed instructional materials. Computer-assisted instruction (CAI) is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. CAI uses a combination of text, graphics, sound and video in enhancing the learning process. The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum.

CAI refers to the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding.

Typical CAI provides

1. text or multimedia content
2. multiple-choice questions
3. problems
4. immediate feedback
5. notes on incorrect responses
6. summarizes students' performance
7. exercises for practice
8. Worksheets and tests.

Types of Computer Assisted Instruction

1. **Drill-and-practice** Drill and practice provide opportunities or students to repeatedly practice the skills that have previously been presented and that further practice is necessary for mastery.
2. **Tutorial** Tutorial activity includes both the presentation of information and its extension into different forms of work, including drill and practice, games and simulation.

3. **Games** Game software often creates a contest to achieve the highest score and either beat others or beat the computer.
4. **Simulation** Simulation software can provide an approximation of reality that does not require the expense of real life or its risks.
5. **Discovery** Discovery approach provides a large database of information specific to a course or content area and challenges the learner to analyze, compare, infer and evaluate based on their explorations of the data.
6. **Problem Solving** This approach helps children develop specific problem solving skills and strategies.

Advantages of CAI

- one-to-one interaction
- great motivator
- freedom to experiment with different options
- instantaneous response/immediate feedback to the answers elicited
- Self pacing - allow students to proceed at their own pace
- Helps teacher can devote more time to individual students
- Privacy helps the shy and slow learner to learns
- Individual attention
- learn more and more rapidly
- multimedia helps to understand difficult concepts through multi sensory approach
- self directed learning – students can decide when, where, and what to learn

Limitations of CAI

- may feel overwhelmed by the information and resources available
- over use of multimedia may divert the attention from the content
- learning becomes too mechanical
- non availability of good CAI packages
- lack of infrastructure

5.2 DEVELOPMENT OF COMPUTER BASED INSTRUCTIONAL PACKAGES

The CIP development process:

The CIP development process developed by Tiranathanagul, Kiattikomol, and Yampinij (1999) consisted of five main steps as follows

1. content analysis
2. instructional design
3. prototyping on paper
4. CIP implementation
5. CIP evaluation.

1. Content analysis

This step involved three steps as follows:

Content brainstorming: This step which lasted for approximately two weeks included identifying the topics that related to the content of the music course. the teacher relied on three experts (teachers from the school) for this purpose.

Concept drafting: Similar topics identified in the first step were grouped.

Content network analysis: All topics were ordered into a content network chart based on their priority in the study. The arrangement of topics followed either sequential or parallel order.

2. Instructional Design

This step involved two main steps as follows:

Strategic presentation plan with behavioral objectives and course flowchart drafting: This step included two sub-steps:

(*a*) **Knowledge Structure Design:** The researchers divided the topics in the content network chart into four modules. Next, all four modules were arranged into the course flow chart. In each module, the researchers assigned the behavioral objectives that covered all topics in the module. The behavioral objectives guided the researchers in the choice and design of the content presentation.

(*b*) **Learning Management System (LMS):** A LMS was created to manage students‘ learning and to track their progress. Students could choose to register if they wanted to keep their learning records. Students could also study without registering if they did not want to keep their learning records.

(c) Module presentation chart drafting: The researchers created a module content chart to give an idea of how the content would be presented in each module. Next, they designed an instructional techniques and media (text, VDO, image, animation, and audio) to present each topic. In this CIP, the researchers used multimedia. The sound was presented simultaneously with the image of the musical instrument. The intention was to stimulate students‘ continuous interaction with thepackage in order to allow them to more easily imagine, understand, and remember concepts. Eachmodule consisted of 5 main parts including: (I) an introduction to the lesson, (II) major and additional content presentation, (III) reinforcement activity, (IV) summary, and (V) test.

3. Prototyping on paper

This step involved four smaller sub-steps as follows:

Script development (interactive subject frames): Paper-based scripts were developed.

Story development by using a storyboard technique: All paper-based scripts were organized into a sequence or parallel.

Content correctness, content validity and reliability check: All paper-based scripts were checked for content correctness by the content experts. Ten, grade 4 to 5 students checked the scripts for content validity and reliability. They were not part of the study‘s sample. They checked the Scripts to ensure that they were meaningful and made sense to them.

Pre- and post- test item development: Test items were developed and evaluated for quality including difficulties, discrimination, validity, and reliability.

4. CIP Implementation

This step consisted of three smaller sub-steps as follows:

Authoring software selection: The researchers selected the authoring software, graphic software, and sound-editing software that could implement all paper-based scripts on a computer system as a courseware package.

Preparing acquisition of ready made or tailor-made media: Before developing a CIP on a computer system, the researchers had to

create all the media such as text, video, animation, image, and audio that would be included in the CIP.

Completion of CIP development: The researchers developed the CIP in the form of CD-ROM by using the authoring software and media.

A questionnaire development: A questionnaire was developed to measure students‘ satisfaction. The questionnaire consisted of nine main items on a five-point Likert scale.

5. CIP Evaluation

Quality evaluation: The multimedia quality of the CIP was evaluated by three experts with experience in instructional design and multimedia. The experts evaluated the CIP multimedia quality by filling in a quality form after they used the CIP. Items related to sound quality, animation and interactivity etc.

Small group rehearsal testing: Ten students not in the sample but from grades 4-5 were randomly selected to test the CIP evaluation process. The rehearsal step was designed to give the researchers an opportunity to ensure that the evaluation process was well prepared.

Evaluation of the CIP: This step involved a number of sub-steps as follows:

- All 40 students completed a pre-test designed to assess their prior knowledge of the contents of the package.
- All students used the CIP independently each day for four days for approximately one hour.
- After students completed all four modules, they then did the post-test.
- They then completed a questionnaire designed to rate their satisfaction with the CIP.
- Pre- and post- test results using descriptive statistics were analysed to evaluate students‘ learning effectiveness (Epost - Epre).
- The questionnaire was analysed to identify students‘ satisfaction with the CIP.

Preparation of user‘s manual for publication: The user manual was developed for the CIP and prepared for publication

5.3 COMPUTERIZED CLASSIFICATION TEST

A **computerized classification test** (**CCT**) refers to, as its name would suggest, a test that is administered by computer for the purpose

of classifying examinees. The most common CCT is a mastery test where the test classifies examinees as “Pass” or “Fail,” but the term also includes tests that classify examinees into more than two categories. While the term may generally be considered to refer to all computer-administered tests for classification, it is usually used to refer to tests that are interactively administered or of variable-length, similar to computerized adaptive testing (CAT). Like CAT, variable-length CCTs can accomplish the goal of the test (accurate classification) with a fraction of the number of items used in a conventional fixed-form test.

A CCT requires several components:

1. An item bank calibrated with a psychometric model selected by the test designer
2. A starting point
3. An item selection algorithm
4. A termination criterion and scoring procedure

The starting point is not a topic of contention; research on CCT primarily investigates the application of different methods for the other three components. Note: The termination criterion and scoring procedure are separate in CAT, but the same in CCT because the test is terminated when a classification is made. Therefore, there are five components that must be specified to design a CAT.A CCT is very similar to a CAT. Items are administered one at a time to an examinee. After the examinee responds to the item, the computer scores it and determines if the examinee is able to be classified yet. If they are, the test is terminated and the examinee is classified. If not, another item is administered. This process repeats until the examinee is classified or another ending point is satisfied (all items in the bank have been administered, or a maximum test length is reached).

Psychometric model

Two approaches are available for the psychometric model of a CCT: classical test theory (CTT) and item response theory (IRT). Classical test theory assumes a state model because it is applied by determining item parameters for a sample of examinees determined to be in each category. For instance, several hundred “masters” and several hundred “nonmasters” might be sampled to determine the difficulty and discrimination for each, but doing so requires that the teacher be able to

easily identify a distinct set of people that are in each group. IRT, on the other hand, assumes a trait model; the knowledge or ability measured by the test is a continuum. The classification groups will need to be more or less arbitrarily defined along the continuum, such as the use of a cutscore to demarcate masters and nonmasters, but the specification of item parameters assumes a trait model. There are advantages and disadvantages to each. CTT offers greater conceptual simplicity. More importantly, CTT requires fewer examinees in the sample for calibration of item parameters to be used eventually in the design of the CCT, making it useful for smaller testing programs. See Frick (1992)[3] for a description of a CTT-based CCT. Most CCTs, however, utilize IRT. IRT offers greater specificity, but the most important reason may be that the design of a CCT (and a CAT) is expensive, and is therefore more likely done by a large testing program with extensive resources. Such a program would likely use IRT.

Starting Point

A CCT must have a specified starting point to enable certain algorithms. If the sequential probability ratio test is used as the termination criterion, it implicitly assumes a starting ratio of 1.0 (equal probability of the examinee being a master or nonmaster). If the termination criterion is a confidence interval approach, a specified starting point on theta must be specified. Usually, this is 0.0, the center of the distribution, but it could also be randomly drawn from a certain distribution if the parameters of the examinee distribution are known. Also, previous information regarding an individual examinee, such as their score the last time they took the test (if re-taking) may be used.

Item Selection

In a CCT, items are selected for administration throughout the test, unlike the traditional method of administering a fixed set of items to all examinees. While this is usually done by individual item, it can also be done in groups of items known as testlets (Leucht & Nungester, 1996;[4] Vos & Glas, 2000[5]).

Methods of item selection fall into two categories: cutscore-based and estimate-based. Cutscore-based methods (also known as sequential selection) maximize the informationprovided by the item at the cutscore, or cutscores if there are more than one, regardless of the ability of the

examinee. Estimate-based methods (also known as adaptive selection) maximize information at the current estimate of examinee ability, regardless of the location of the cutscore. Both work efficiently, but the efficiency depends in part on the termination criterion employed. Because the sequential probability ratio test only evaluates probabilities near the cutscore, cutscore-based item selection is more appropriate. Because the confidence interval termination criterion is centered around the examinees ability estimate, estimate-based item selection is more appropriate. This is because the test will make a classification when the confidence interval is small enough to be completely above or below the cutscore (see below). The confidence interval will be smaller when the standard error of measurement is smaller, and the standard error of measurement will be smaller when there is more information at the theta level of the examinee.

Termination Creterion

There are three termination criteria commonly used for CCTs. Bayesian decision theory methods offer great flexibility by presenting an infinite choice of loss/utility structures and evaluation considerations, but also introduce greater arbitrariness. A confidence interval approach calculates a confidence interval around the examinee's current theta estimate at each point in the test, and classifies the examinee when the interval falls completely within a region of theta that defines a classification. This was originally known as adaptive mastery testing (Kingsbury & Weiss, 1983), but does not necessarily require adaptive item selection, nor is it limited to the two-classification mastery testing situation. The sequential probability ratio test (Reckase, 1983) defines the classification problem as a hypothesis test that the examinee's theta is equal to a specified point above the cutscore or a specified point below the cutscore.

Computerized test : Construction and Administration

Computerized adaptive testing (**CAT**) is a form of computer-based test that adapts to the examinee's ability level. For this reason, it has also been called **tailored testing**. In other words, it is a form of computer-administered test in which the next item or set of items selected to be administered depends on the correctness of the test taker's responses to the most recent items administered. CAT successively

selects questions for the purpose of maximizing the precision of the exam based on what is known about the examinee from previous questions.[2] From the examinee's perspective, the difficulty of the exam seems to tailor itself to their level of ability. For example, if an examinee performs well on an item of intermediate difficulty, they will then be presented with a more difficult question. Or, if they performed poorly, they would be presented with a simpler question. Compared to static multiple choice tests that nearly everyone has experienced, with a fixed set of items administered to all examinees, computer-adaptive tests require fewer test items to arrive at equally accurate scores.[2] (Of course, there is nothing about the CAT methodology that requires the items to be multiple-choice; but just as most exams are multiple-choice, most CAT exams also use this format.)

The basic computer-adaptive testing method is an iterative algorithm with the following steps:[3]

1. The pool of available items is searched for the optimal item, based on the current estimate of the examinee's ability
2. The chosen item is presented to the examinee, who then answers it correctly or incorrectly
3. The ability estimate is updated, based upon all prior answers
4. Steps 1–3 are repeated until a termination criterion is met

Nothing is known about the examinee prior to the administration of the first item, so the algorithm is generally started by selecting an item of medium, or medium-easy, difficulty as the first item.As a result of adaptive administration, different examinees receive quite different tests.[4] The psychometric technology that allows equitable scores to be computed across different sets of items is item response theory (IRT). IRT is also the preferred methodology for selecting optimal items which are typically selected on the basis of information rather than difficulty. In the United States, the Graduate Management Admission Test are currently primarily administered as a computer-adaptive test. A list of active CAT programs is found at International Association for Computerized Adaptive Testing, along with a list of current CAT research programs and a near-inclusive bibliography of all published CAT research.

A related methodology called multistage testing (MST) or CAST is used in the Uniform Certified Public Accountant Examination. MST

avoids or reduces some of the disadvantages of CAT as described below. See the 2006 special issue of Applied Measurement in Education for more information on MST.

Advantages

- Adaptive tests can provide uniformly precise scores for most test-takers.[3] In contrast, standard fixed tests almost always provide the best precision for test-takers of medium ability and increasingly poorer precision for test-takers with more extreme test scores.
- An adaptive test can typically be shortened by 50% and still maintain a higher level of precision than a fixed version.[2] This translates into a time savings for the test-taker. Test-takers do not waste their time attempting items that are too hard or trivially easy. Additionally, the testing organization benefits from the time savings; the cost of examinee seat time is substantially reduced. However, because the development of a CAT involves much more expense than a standard fixed-form test, a large population is necessary for a CAT testing program to be financially fruitful.
- Large target populations can generally be exhibited in scientific and research-based fields. CAT testing in these aspects may be used to catch early onset of disabilities or diseases. The growth of CAT testing in these fields has increased greatly in the past 10 years. Once not accepted in medical facilities and laboratories, CAT testing is now encouraged in the scope of diagnostics.
- Like any computer-based test, adaptive tests may show results immediately after testing.
- Adaptive testing, depending on the item selection algorithm, may reduce exposure of some items because examinees typically receive different sets of items rather than the whole population being administered a single set. However, it may increase the exposure of others (namely the medium or medium/easy items presented to most examinees at the beginning of the test)

Disadvantages

- The first issue encountered in CAT is the calibration of the item pool. In order to model the characteristics of the items (e.g., to pick the optimal item), all the items of the test must be pre-administered

to a sizable sample and then analyzed. To achieve this, new items must be mixed into the operational items of an exam (the responses are recorded but do not contribute to the test-takers' scores), called "pilot testing", "pre-testing", or "seeding".[3] This presents logistical, ethical, and security issues. For example, it is impossible to field an operational adaptive test with brand-new, unseen items;[5] all items must be pretested with a large enough sample to obtain stable item statistics. This sample may be required to be as large as 1,000 examinees.[5] Each program must decide what percentage of the test can reasonably be composed of unscored pilot test items.

- Although adaptive tests have exposure control algorithms to prevent overuse of a few items,[3] the exposure conditioned upon ability is often not controlled and can easily become close to 1. That is, it is common for some items to become very common on tests for people of the same ability. This is a serious security concern because groups sharing items may well have a similar functional ability level. In fact, a completely randomized exam is the most secure (but also least efficient).
- Review of past items is generally disallowed. Adaptive tests tend to administer easier items after a person answers incorrectly. Supposedly, an astute test-taker could use such clues to detect incorrect answers and correct them. Or, test-takers could be coached to deliberately pick wrong answers, leading to an increasingly easier test. After tricking the adaptive test into building a maximally easy exam, they could then review the items and answer them correctly—possibly achieving a very high score. Test-takers frequently complain about the inability to review.[6]
- Because of the sophistication, the development of a CAT has a number of prerequisites.[7] The large sample sizes (typically hundreds of examinees) required by IRT calibrations must be present. Items must be scorable in real time if a new item is to be selected instantaneously. Psychometricians experienced with IRT calibrations and CAT simulation research are necessary to provide validity documentation. Finally, a software system capable of true IRT-based CAT must be available.
- In a CAT with a time limit it is impossible for the examinee to accurately budget the time the student can spend on each test item and to determine if the student is on pace to complete a timed test section. Test takers may thus be penalized for spending too much time on a difficult question which is presented early in a section and then failing to complete enough questions to accurately gauge their proficiency in areas which are left untested when time expires.[8] While untimed CATs are excellent tools for formative assessments which guide subsequent instruction, they are unsuitable for summative assessments used to measure aptitude for jobs and educational programs.

Components

There are five technical components in building a CAT (the following is adapted from Weiss & Kingsbury, 1984). This list does not include practical issues, such as item pretesting or live field release.

1. Calibrated item pool
2. Starting point or entry level
3. Item selection algorithm
4. Scoring procedure
5. Termination criterion

Calibrated item pool

A pool of items must be available for the CAT to choose from. The pool must be calibrated with a psychometric model, which is used as a basis for the remaining four components. Typically, item response theory is employed as the psychometric model. One reason item response theory is popular is because it places persons and items on the same metric (denoted by the Greek letter theta), which is helpful for issues in item selection (see below).

Starting point

In CAT, items are selected based on the examinee's performance up to a given point in the test. However, the CAT is obviously not able to make any specific estimate of examinee ability when no items have been administered. So some other initial estimate of examinee ability is necessary. If some previous information regarding the examinee is known, it can be used, but often the CAT just assumes that the examinee is of average ability - hence the first item often being of medium difficulty.

Item selection algorithm

As mentioned previously, item response theory places examinees and items on the same metric. Therefore, if the CAT has an estimate of examinee ability, it is able to select an item that is most appropriate for that estimate. Technically, this is done by selecting the item with the greatest information at that point.[2] Information is a function of the discrimination parameter of the item, as well as the conditional variance and pseudoguessing parameter (if used).

Scoring procedure

After an item is administered, the CAT updates its estimate of the examinee's ability level. If the examinee answered the item correctly, the CAT will likely estimate their ability to be somewhat higher, and vice versa. This is done by using the item response function from item response theory to obtain a likelihood function of the examinee's ability. Two methods for this are called maximum likelihood estimation and Bayesian estimation. The latter assumes an a priori distribution of examinee ability, and has two commonly used estimators: expectation a posteriori and maximum a posteriori. Maximum likelihood is equivalent to a Bayes maximum a posteriori estimate if a uniform (f(x)=1) prior is assumed. Maximum likelihood is asymptotically unbiased, but cannot provide a theta estimate for a nonmixed (all correct or incorrect) response vector, in which case a Bayesian method may have to be used temporarily.

Termination criterion

The CAT algorithm is designed to repeatedly administer items and update the estimate of examinee ability. This will continue until the item pool is exhausted unless a termination criterion is incorporated into the CAT. Often, the test is terminated when the examinee's standard error of measurement falls below a certain user-specified value, hence the statement above that an advantage is that examinee scores will be uniformly precise or "equiprecise." Other termination criteria exist for different purposes of the test, such as if the test is designed only to determine if the examinee should "Pass" or "Fail" the test, rather than obtaining a precise estimate of their ability.

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