Issues in Educational Science and Technology

Edited by: **Dr. David Anderson**

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e-book Edition 2022

ISBN: 978-1-98467-827-0 (e-book)

In Collaboration with Magnum Publishing. Originally Published in printed book format by Magnum Publishing with ISBN 978-1-68250-74 -8

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PREFACE

Today, technology is possibly the most powerful factor shaping the educational landscape. Many school districts are demonstrating their support for increased thresholds of technology in schools by providing hardware like tablets and computers, improving internet connectivity, as well as implementing programs aimed at improving computer literacy both for teachers and students. Modern information and communication technology (ICT) has the potential to fundamentally transform education, but this potential has yet to be realized. As modern ICTs continue to progress rapidly and intensely change almost each aspect of society, it is fundamental that the field of education benefits from ICT advancement in order to prepare the next generation of digital citizens.

This book deals with conceptual and empirical information that examine critical issues around technology integration in education. It is clear the challenges that educational technologists face regarding technology integration in learning, instruction, and performance are significant and that the current state of educational technology research reminds one of the challenge of shooting at a moving target. The field of educational technology is a dynamic discipline. However, an agreement on some basic definitions, make it easier to frame a discussion of the future of educational technology. Technology [educational] integration is the incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools. Technology resources are computers and specialized software, network-based communication systems, and other equipment and infrastructure. Practices include collaborative work and communication, Internet-based research, remote access to instrumentation, network-based transmission and retrieval of data, and other methods. Some challenges confound small-scale ETI system upgrades or expansion work, while other challenges wreak havoc on large-scale and system-wide efforts. An understanding of these potential challenges can prepare educational technologists to meet them head-on across the modern multicultural community. The book focuses on K-12 contexts and defines educational technologists as the front-line professionals who are educated and trained to address the challenges of analyzing, designing, developing, implementing, evaluating and researching technology integration in educational settings. However motivated, educational technologists will encounter many challenges involving planning, people, resources and ethical issues that can jeopardize ETI solutions and outcomes.

CHAPTER 1

INTRODUCTION TO EDUCATIONAL TECHNOLOGY

INTRODUCTION

Educational technology is the combined use of computer hardware, software, and educational theory and practice to facilitate learning. When referred to with its abbreviation, EdTech, it is often referring to the industry of companies that create educational technology. In addition to practical educational experience, educational technology is based on theoretical knowledge from various disciplines such as communication, education, psychology, sociology, artificial intelligence, and computer science. It encompasses several domains including learning theory, computer-based training, online learning, and m-learning, where mobile technologies are used.

The Challenges that educational technologists face regarding technology integration in learning, instruction, and performance are significant and that the current state of educational technology research reminds one of the challenge of shooting at a moving target. The "getting a new idea adopted, even when it has obvious advantages, is difficult" and often involves a sort of social change that alters the very structure and function of a social system. Cuban agreed and further argued that educational technology integration initiatives often go hand-in-hand with discussions about educational reform and systemic change.

As educational technologists are brought into a project with new information and communication technologies, changes in instructional approaches, and new learning activities it is also a challenge to keep the focus remaining on an organization's basic educational goals.

The field of educational technology is a dynamic discipline, and as Finger says "we can only speculate what technologies, teaching and learning might look like towards the end of this century. However, an agreement on some basic definitions, make it easier to frame a discussion of the future of educational technology.

1.1 CONCEPT OF EDUCATIONAL TECHNOLOGY

Educational technology refers to various forms of technology that can be used to improve or enhance the learning process for students. The exact nature of such technology, however, can change fairly often as new hardware and software become available for students and teachers.

This sort of technology can be used both in and out of the classroom, and can be utilized by teachers or enhance the ability of students to learn materials on their own.

This technology often includes computer software that allows students to communicate with each other online, smart-boards used in the classroom, and educational video games.

One of the most important aspects of educational technology is that it is constantly changing and advancing as progress in technology in general is made. A number of educators commit a great deal of time and effort to finding ways to effectively use new technology in and out of the classroom. Entire schools and degrees are now offered to students through virtual classrooms over the Internet, providing new educational opportunities for students all over the world.

These online classes are one of the major ways in which educational technology has changed how many people view education. Using various utilities and software applications, online classes allow students to view video of lectures given in a classroom, which can even be a virtual classroom in which a teacher is standing in front of a digital image that can change to reflect the material being discussed. Students can also use the technology to communicate with each other online, using forums to create lasting records of class discussions and sharing resources to create group projects through telecommunications.

Educational technology can also include classroom hardware such as smart-boards. These are effectively dry erase whiteboards that connect to a computer to act as both whiteboard and monitor. Teachers can type information or play videos on a computer — all displayed on the smart-board — and use special markers to draw and interact with the data from the computer. This educational technology allows teachers to create more unique and experiential learning opportunities for students.

There are also a number of software developers looking into video games as a form of educational technology. While educational games have been maligned by some gamers in the past, a few developers have found ways to make educational games fun and provide learning through entertainment. Such games often encourage players to develop stronger language skills by using words and spelling to create effects on the game world, demonstrating advancement and success through effective communication. These games often have a positive influence on young players, who learn to associate achievement with the use of critical thinking and problem solving skills.

1.1.1 Types of Educational Technology

Educational technology is the effective use of technological tools in learning. As a Concept, it concerns an array of tools, such as media, machines and networking hardware, as well as considering underlying theoretical perspectives for their effective application.

Synchronous and Asynchronous

Learning can occur in or out of the classroom. It can be self-paced, asynchronous learning or may be instructor-led, synchronous learning. It is suited to distance learning and in conjunction with face-to-face teaching, which is termed blended learning. Virtual classroom can be used by learners and educators in homes, schools, businesses and other settings for effective online collaboration.

Synchronous learning refer to exchange of ideas and information with others participants during the same period. Examples are face-to-face discussion, online real-time live teacher instruction and feedback, Skype conversations, and chat rooms or virtual classroom where everyone is online and working collaboratively at the same time. Since students are working collaboratively, synchronized learning helps students create an open mind because they have to listen and learn from their peers. Synchronized learning fosters online awareness and improves many students writing skills.

Asynchronous learning may use technologies such as email, blogs, wikis, and discussion boards, as well as web-supported textbooks, hypertext documents, audio, video courses, and social networking using web. In asynchronous online courses, students proceed at their own pace. If they need to listen to a lecture a second time, or think about a question for a while, they may do so without fearing that they will hold back the rest of the class. Through online course, students can earn their diplomas more quickly, or repeat failed course without the embarrassment of being in a class with younger students. Students have access to an incredible variety of course, internships, sport or work and still graduate with their class.

Linear Learning

Computer-based training (CBT) refers to self-paced learning activities delivered on a computer or handheld device such as a tablet or smartphone. CBT initially delivered content via CD-ROM, and typically presented content linearly, much like reading an online book or manual. For this reason, CBT is often used to teach static processes, such as using software or completing mathematical equations. Computer-based training is conceptually similar to web-based training (WBT) which are delivered via internet using a web browser.

Assessing learning in a CBT is often by assessments that can be easily scored by a computer such as multiple choice questions, drag-and-drop, radio button, simulation or other interactive means. Assessments are easily scored and recorded via online software, providing immediate end-user feedback and completion status. Users are often able to print completion records in the form of certificates.

CBT provide learning stimulus beyond traditional learning methodology from textbook, manual or classroom-based instruction. CBT can be a good alternative to printed learning materials since rich media, including videos or animations, can be embedded to enhance the learning.

Collaborative Learning

Computer-supported collaborative learning (CSCL) uses instructional methods designed to encourage or require students to work together on learning tasks. CSCL is similar in concept to the terminology, "e-leaning 2.0" and "networked collaborative leaning" (NCL).

With technological Web 2.0 advances, sharing information between multiple people in a network has become much easier and use has increased. One of the main reasons for its usage state that it is "a breeding group for creative and engaging educational endeavors.

1.1.2 Difference between Hardware and Software Technology

Though there is difference in the aspects being stressed the hardware and software approaches, in educational technology they are functionally related to each other. Both software and hardware approaches are so interlinked that they cannot be separated from each other.

Hardware Technology	Software Technology
1. Hardware technology has its origin in physical sciences and applied engineering.	1. Software technology has its origin in behavioral sciences and their applied aspects concerning psychology of learning
2. Here we are more concerned with the production and utilization of audio visual aid material and sophisticated instruments and mass media for helping teacher and learners in their task.	2. Here we try to make use of psychology of learning for the production and utilization of software techniques and materials in terms of learning material, teaching-learning strategies and other devices for smoothening the task of teaching learning.

3. It tries to adopt product-oriented approach. What is produced through software technology in the shape of teaching-learning material and strategy in being utilized by the hardware instruments and gadgets for effective teaching learning?	3. It tries to adopt a process-oriented technique or approach for the production of teaching-learning material and strategies. The material produced here is made available for being used by the hardware application.
4. It is based on the concept of service meaning hereby that it provides services in the field of education much in the same way as provided by telephone, electric heater, bulb etc. in the sphere of our day to day life. In this sense hardware technology clearly stands for making use of technology in education.	4. Software technology does not provide direct services to its users as provided by hardware technology and applied engineering. It helps in the production of software material being used by the hardware applications and gadgets for delivering their service to the users i.e. teachers and learners.
5. As examples of the appliances and gadgets being used in hardware technology service we can name radio, television, tape recorder, video, slides and film projectors, teaching machines and computer etc.	5. As examples of the material produced through software technology we can name, programmed learning material teaching learning strategy on psychology of learning (put into practice in the shape of charts, pictures, models, slides filmstrips, audio and video cassettes, software packages etc.)
6. Hardware technology needs the services of software technology for its use and functioning. It can't go without the aid of software technology e.g. computer hardware in the shape of a machine like device is of no use if it does not make use of software services both for its operation as a machine and its multidimensional utilities. The use of application and utility software is in fact must for taking any service from the hardware technology of the computer.	6. Software technology proves most useful and productive in the case if it is assisted and made into use by the hardware applications and gadgets. However, it can go alone for delivering its services to the users without calling aid from the hardware technology i.e. you can make use of programmed learning material a graph a text, etc. directly for the individualized as well as group instructions.

7. Hardware technology has its mass appeal and utilization. It can contribute a lot in handing over the educational benefits to masses with greater case and economy.	7. Software technology has no such wide application and appeal to masses as found in the case of hardware appliances like radio, telephone, computer application, etc.
8. Hardware technology has resulted in improving the efficiency of educational, means and reducing the cost of education. A teacher may handle a big class with the help of hardware appliances like microphone, slide and film projectors etc.	8. Software technology also works for increasing the efficiency of the teachers as well as learning. However, it lags behind in the task of improving efficiency and reducing the cost of education.

Use of Hardware and Software Education

Educational Technology means the use of all kinds of modem media, methods and materials for maximizing the learning experiences. Educational technology includes the entire process of try-out of methods and materials at one head and evaluation of the system as an integrated whole on the other-hand.

Educational technology uses various technological equipment's ranging from chalk-boards to computers. It involves books, papers and pencils, maps, globes, film-projectors, slide- projectors, language laboratories, tape-recorders, radio, televisions, video-tape recorders and computers. In brief, we say all the audio-visual equipment's are regarded as the Educational Technology.

But these audio-visual materials are only one aspect of educational technology. This is called hardware aspect of educational technology. But educational technology involves use of various principles, processes, techniques and methods of education. So the other aspect of educational technology is new methods of teaching, tested principles and practices, innovations such as programmed Learning, micro- teaching, team-teaching etc.

These aspects of educational technology are called soft-ware approach of educational technology. Both hardware and software constitute the concept of educational technology Educational technology is a global process which envisages all these components like hardware in education and software in education. Any single interpretation is partial in its meaning and cannot convey the complete meaning of educational technology. So both these approaches to go hand in hand to maximize the effects of teaching learning process.

1. *The Hardware Approach:-* The hardware approach is based on the application of engineering principles for developing electromechanical equipment's like radio and television sets, tape-recorders and projectors, teaching machines and computers etc. This approach of educational technology is a bye-product of the scientific and technological developments of the present century.

So hardware in education is nothing but the technology is education. A large number of sophisticated equipment's are used for effective learning. So technology in education refers to this mechanization of learning by use of such electromechanical or technological equipment's and materials.

2. *The Soft-ware Approach:-* But on the other hand, Software approach is based on the use of the principles of Psychology for behavior modification purposes. It implies use of methods, techniques and media in teaching-learning process. The academic materials and methods like Radio and Television programmes, teaching models like programmed instruction, micro-teaching, team-teaching and interaction analysis etc. from soft-ware in education. All these devices are used for assessing and evaluating learning outcomes.

This approach is directly related to the psychology of learning which comprises behavioral changes resulting from experiences. So all innovations like programmed learning, micro-teaching, term-teaching, new methods of teaching, tested principles and practices in the area of curriculum, methods of instruction and evaluation, are called soft-ware component of educational technology. Therefore, soft-ware in education in nothing but technology of education. Because technology of education refers to the application of various principles, processes, techniques and methods in education. It deals with the systematic and effective application of various devices.

The so-called soft-ware and hardware approaches cannot be separated from each other," In a manner, both are interlinked to plant the seed of education technology which is developing with other essential ingredients of other varieties (like system engineering, educational planning, and management)." Both hardware and software are like two aspects of the same coin and go hand in hand to maximize the effects of teaching learning process.

Educational Technology as a global process envisages both the hardware approach (Technology in education) and soft-ware approach (Technology of education) in education. Both the approaches in educational technology make the process of education effective and optimistic.

In a narrow, sense, the concept of educational technology may be interpreted as the use of hardware in teaching. In a broad sense, this concept may be interpreted as the use of any new educational techniques. Thus an integrated or system approach will make the teaching-learning process more effective.

Each component will contribute its maximum and complement each other according to the socio-psychological background of the learner. In fact, the concept of educational technology means more than the sum total of all the media and methods, instructional materials and techniques used for effective teaching and learning.

Day-by-day, there is explosion of knowledge. The horizon of human knowledge is expanding very fast. Everywhere there is change. The concept of 'literacy' is changing to 'mediacy'. The concept of 'chalkboard' is changing to 'Sky-board'.

The concept of classroom may also change. There is no denying the fact that all the technological materials and methods have brought certain changes in the teaching-learning process due to the advancement of science and technology.

We have to accept teaching machines, programmed texts. Radio and T. V, programmes all the innovative media, materials and methods to make the teaching-learning more effective. For this propose, the teacher is to play a crucial role in order to utilize the educational technology in an integrated manner. Because educational technology stresses more on the aspect of soft-ware in education rather than hardware in education.

Restructuring the effective learning environment with the help of hardware and software by the teacher is very important for effective learning. So all the available resources should be explored by the teacher. All the resources means and media in the form of hardware and software, are to be coordinated and integrated in order to make teaching-learning more effective.

The teacher has to utilize them appropriately in right place, in right manner and in right time. Training in the use of hardware and software help, a teacher to be good and efficient in his teaching. Hence, the educational outputs of the teacher will certainly maximize through judicious uses of these hardware and software in education.

1.1.3 Role of Hardware and Software Technologies in Modern Educational Practices

1. Making the task of teaching-learning interest, purposeful and productive

- Suggesting suitable teaching-learning methods, devices and strategies based on psychology of teaching-learning.

- Suggesting suitable maxims and principle of teaching-learning based on the theory and practice of technology of teaching-learning.
- Putting various types of audio-visual aid and materials and equipment at the disposal of teachers and learners.
- Providing a variety of instructional and self-learning material suiting the varying needs of teaching-learning situations and individuality of the teacher and learners.

2. Use the multimedia and multi-sensory approach to teaching-learning

Hardware and software technologies help the teacher as well as the learners for making a proper and judicious use of multimedia and multi-sensory aid material, equipment and principles of teaching-learning, derived from psychology and technology of teaching.

- All the sensory organs sense the sight, hearing, touch, smell and taste for the acquisition of the desired teaching-learning experiences.
- Multimedia, material and appliance involving hardware and software technologies for sharing desirable teaching-learning technologies.
- All the relevant and needed teaching-learning method, devices, and strategies, well-accompanied and aided by hardware and software technologies.

3. Management of the affairs of educational practices in an efficient and productive way

Educational and professional responsibilities

- Planning o teaching-learning.
- Organization of teaching-learning.
- Leading teaching-learning.
- Controlling teaching-learning.

4. Providing proper input and process for the best possible outcomes (products)

The true spirit of the system engineering, use of hardware and software technologies can help the educational and instruction system to make all possible efforts for providing adequate and the needed process organizations to arrive at the best possible outcomes.

5. Fulfilling the expectation of distances and correspondence education

The demands of today's education and modern education practices are putting increase emphasis on the extension of distance education and correspondence and online education facilities to the increasing number of learners.

6. Individualization of instruction

Individualization of instruction is a major trend in the modern educational practices and is the demand of the hour. In brief, we can highlight the role of hardware and software technologies on this account by stating some of the materials and equipment as follows:

- Programmed instruction, programmed books, and programmed learning modules.
- Teaching machines, computer assisted instruction and computer managed learning.
- Video and audio recorded learning and instructional material.
- Email, internet, teleconferencing and other online educational facilities.
- Special aid material, equipment and appliances used for special education and adjustment measure of for the disabled.

- Special provisions and facilities for the creative and gifted to nature and develop their individual capacities according to their pace and interest.

1.1.4 What Does an Instructional Technologist Do?

Instructional technologists are professionals who design technology-based curricula that teachers can use to meet their goals when educating students. These individuals must be extremely computer-savvy and detail-oriented. An individual who wishes to become an instructional technologist typically must complete a four-year bachelor's degree in this field. He or she has the responsibility of helping instructors to determine the types of technologies that they need in the educational setting, and then teaches educators and students how to use them. The professional also researches new technologies that he or she can introduce and must stay current on industry software.

A chief duty of an instructional technologist is to help teachers to decide what types of technologies that they need to fulfill their classroom goals. This type of professional meets with instructors and subject matter experts to determine what courses need to be designed or even re-created for teaching online courses or hybrid classes, which feature both on-site and Internet-based instruction. He or she must be creative and needs to have strong communication and listening skills when working with faculty.

Another major responsibility of an employee in this field is to complete training and quality assurance activities. An instructional technologist teaches faculty how to use the curricula programs that he or she designs. In addition, he or she might have to educate students about to use a new online course format via a workshop. The field professional further monitors his or her designed products to make sure that the quality of instruction that he or she provides meets established standards and that the technological systems used to deliver training continue to work properly.

An individual in this career area must always be willing to strive toward improving his or her work. He or she needs to complete research to find out what new types of technologies are available in the market that can help his or her clients to better complete their educational jobs. Coverage of new products such as digital cameras or digital whiteboards — the modern version of traditional chalkboards — often takes place at industry conference seminars that are designed for a person who works as an instructional technologist. Staying up-to-date on software and programming languages used in this vocational area additionally constitutes a task in this industry. For example, professionals in this line of work often use computer languages designed to create user interfaces, or points where humans and computers interact. In addition, they must master languages created to draft documents for academic purposes. Software in this field constantly evolves, so an instructional technologist has to be willing to complete continuing education courses to stay current on developments in these programs.

1.1.5 Technology Challenges Facing Education

Despite increasingly widespread adoption of technologies in virtually every aspect of K-12 education, significant challenges are preventing widespread effective implementation. Though some of those challenges are systemic and some related to the technologies themselves, teachers and education leaders share in the blame as well.

Those challenges have centered largely on reluctance on the part of administrators and teachers, lack of preparation, and lack of support or funding. This year's findings followed largely along those lines as well, though some new challenges were identified as well.

Challenge 1: professional development

Key among all challenges is the lack of adequate, ongoing professional development for teachers who are required to integrate new technologies into their classrooms yet who are unprepared or unable to understand new technologies.

Challenge 2: resistance to change

Resistance to technology comes in many forms, but one of the key resistance challenges identified in the report is "comfort with the status quo." According to the researchers, teachers and school leaders often see technological experimentation as outside the scope of their job descriptions.

Challenge 3: MOOCs and other new models for schooling

New in this year's report, new models for teaching and learning are providing "unprecedented competition to traditional models of schooling." In particular, the MOOC (massive open online course) probably the hottest topic in higher education right now was identified as being "at the forefront" of discussions about new modes of delivering K-12 education.

"K-12 institutions are latecomers to distance education in most cases, but competition from specialized charter schools and for-profit providers has called attention to the needs of today's students, especially those at risk".

Challenge 4: delivering informal learning

Related to challenge 3, rigid lecture-and-test models of learning are failing to challenge students to experiment and engage in informal learning. But, according to the report, opportunities for such informal learning can be found in non-traditional classroom models, such as flipped classrooms, which allow for a blending of formal and informal learning.

Challenge 5: failures of personalized learning

There's a gap between the vision of delivering personalized, differentiated instruction and the technologies available to make this possible. So while K-12 teachers seem to see the need for personalized learning, they are not being given the tools they need to accomplish it, or adequate tools simply don't exist.

Challenge 6: failure to use technology to deliver effective formative assessments

"Assessment is an important driver for educational practice and change, and over the last years we have seen a welcome rise in the use of formative assessment in educational practice. However, there is still an assessment gap in how changes in curricula and new skill demands are implemented in education; schools do not always make necessary adjustments in assessment practices as a consequence of these changes. Simple applications of digital media tools, like webcams that allow non-disruptive peer observation, offer considerable promise in giving teachers timely feedback they can use."

1.2 EDUCATIONAL TECHNOLOGY: NATURE AND ASSUMPTIONS

Educational technology is a field of study that investigates the process of analyzing, designing, developing, implementing, and evaluating the instructional environment and learning materials in order to improve teaching and learning. It is important to keep in mind that the purpose of educational technology (also referred to as instructional technology) is to improve education. We must define the goals and needs of education first and then we use all our knowledge, including technology, to design the most effective learning environment for students.

Instructional technology can also be seen as a process of solving educational problems and concerns, which might include motivation, discipline, the drop-out rate, school violence, basic skills, critical thinking, and the whole list of educational concerns. First, the problem is identified, an analysis of the factors of the problem is made, and possible solutions to the problem are presented. Then, the student population and the curriculum are analyzed. The next step is to select the most appropriate instructional strategies for the particular situation. Next, instructional materials and resources are selected that are suitable for the curriculum and the mode of instruction chosen. Finally, the program is implemented, evaluated, and revised as needed in order to meet the stated goals for school improvement.

The learning materials today have greatly expanded because of the various technological advances. Instructional materials include more conventional materials, such as the blackboard, overhead projectors, televisions, VCRs, overhead projectors, slide projectors, and opaque projectors, as well as newer materials, such as the computer, various software applications, LCD projectors, camcorders, digital cameras, scanners, the Internet, satellite, interactive TV, audio and video conferencing, artificial intelligence, and so on.

Teachers in the public schools and faculty at universities need to understand what types of materials are available, how to use them, why they should be used, when they should be used, and how to integrate them into the teaching/learning environment in order to meet the ultimate goal of improving education. Teachers also need to seriously consider how these newer materials can affect what and how we learn and teach.

The issue of what these materials are and how to use them is a first step. But we must quickly begin to discuss how these materials should be used and how they affect the curriculum and instruction in our schools. Technology can be used to perpetuate a teacher-led, knowledge-based learning approach or it can be used to help us implement a student-centered, constructivist, and progressive approach. We need to help teachers to understand the bigger picture of how technology can revolutionize education. Just teaching teachers how to use the technology will lead to enhancing a knowledge-level educational system. Teaching them the real potentials of technology will lead to promoting higher-level thinking, independent learning, and life-long learning.

The skills and issues that need to be addressed by teachers are vast. To help in understanding what these skills and issues are, the Coordinator of Educational Technology at UNCA has created a list of items regarding educational technology. These are items that the faculty at the universities need to understand so that they can incorporate them into their own teaching and thus help preservice teachers understand them so that they can more effectively utilize technology in their own teaching as well.

1. The Productivity Assumption

This is the idea that we need to increase higher education productivity, and that technology will be the means to do so. The idea of productivity captures both quality (however measured) and cost (however calculated). The assumption is that we need to find ways to simultaneously raise quality (which is variable at best) while bending the educational cost curve (which has gone up at about twice the rate of inflation for the last 30 years).

2. The Technology is a Lever Assumption:

The belief that technology can be an effective lever to improve postsecondary education. The idea that technology is never strategic, but rather the tactical tools that we use to reach our strategic goals. (With goals clustered around the iron triangle of quality, costs and access). The assumption here is technology will a positive force, and that if only higher education can utilize technology as effectively as other industries that we will see improvements in postsecondary productivity.

3. The Disruption Assumption

The assumption that educational technology will also follow the innovators dilemma narrative. That the path to higher quality learning technologies will inevitably first go through lower cost and inferior platforms and services. That the system of higher education is not immune from the forces facing other industries. So today's lower cost and lower quality postsecondary offerings will inevitably evolve and improve, eventually displacing large numbers of higher ed. incumbents.

4. The Active Learning Assumption:

This is assumption that active learning is good and passive learning is bad (however we define active and passive). In practice, this assumption translates into a goal to move away from courses-as-information transfer (the traditional large lecture) to courses as opportunities for creation and discovery. Technologies that make large classes feel like small classes (seminars) are thought to be beneficial for learning.

5. The Relationship Assumption

This is the idea that authentic learning is inherently relational. That a valuable learning experience is one based on personal interaction, mentorship and coaching between an educator and a learner. The Web has dropped the price, and therefore the value (or at least what people will pay) of information to near zero. We can access more free online course based information, from MOOCs to iTunesU to Open Course Ware, than we could have hope to consume in a lifetime. Therefore, what is valuable is not information (which has become commoditized), but the degree to which learning takes place in the context of relationship between educators and learners. Embedded in this relationship assumption is the twin idea that postsecondary education is valuable beyond the credential, and that authentic education does not conform to the economics of the Web.

6. The Blended Learning Assumption

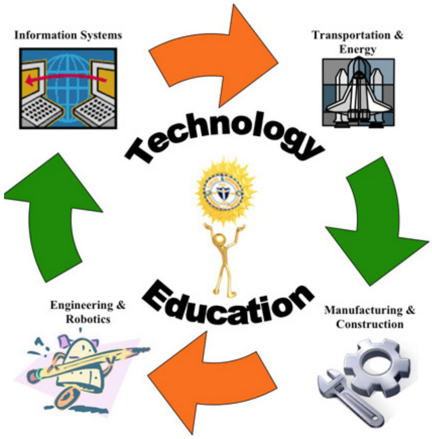
This is the assumption that the best courses will usually be blended courses. Partly face-to-face and partly online. A blend where precious classroom time is utilized for those activities best accomplished in the same room at the same time. Where we flip the classroom to provide content and opportunities for discussion and questions, and utilize classroom time to reinforce key concepts, clear up muddy points, and engage in activities that help learners build, construct and consolidate knowledge.

7. The Consumerization Assumption

This is the idea that consumer technology is setting the pace for educational technology. That the digital consumer experience is getting better faster than the digital education experience. The assumption is that higher education needs to in some sense keep up with the consumer world of technology if we are to remain relevant to our students. That it is bad if a student can watch Netflix or Hulu on any screen that she owns, but can't access course materials and assignments. That Amazon is changing the book buying and reading experience faster than we are changing the higher education experience. That consumer technologies move much faster than our educational enterprise technologies, and at some point we need to get out of the way of our community and let them choose and bring their own technology.

1.2.1 Nature and, Scope of Educational Technology

The term educational technology is often associated with, and encompasses, instructional theory and learning theory. While instructional technology covers the processes and systems of learning and instruction, educational technology includes other systems used in the process of developing human capability. Educational Technology includes, but is not limited to, software, hardware, as well as Internet applications and activities. Educational technology is most simply and comfortably defined as an array of tools that might prove helpful in advancing student learning. Educational Technology relies on a broad definition of the word "technology". Technology can refer to material objects of use to humanity, such as machines or hardware, but it can also encompass broader themes, including systems, methods of organization, and techniques. Some modern tools include but are not limited to overhead projectors, laptop computers, and calculators.



Newer tools such as "smart phones" and games (both online and offline) are beginning to draw serious attention for their learning potential. Those who employ educational technologies to explore ideas and communicate meaning are learners or teachers. In other words, any valid and reliable process or procedure that is derived from basic research using the "scientific method" is considered a "technology." Educational Technology may be based purely on algorithmic or heuristic processes, but neither necessarily implies physical technology. The word technology comes from the Greek "techne" which means craft or art. Another word, "technique," with the same origin, also may be used when considering the field Educational Technology. So Educational Technology may be extended to include the techniques of the educator.

Educational technology is an inclusive term for both the material tools and the theoretical foundations for supporting learning and teaching. Educational technology is not restricted to high technology. Education technology is anything that enhances classroom learning in the utilization of blended or online learning.

Nature

The movement towards educational technology began to develop after World War II. Initially the term meant using audiovisual communications media. However, the field of educational technology began to focus on the development of teaching and learning procedures borrowed from behavioral psychology. Today, the field also incorporates cognitive psychology, social psychology, psychometrics, perception psychology and management. Educational technology has under its preview the following aspects:

- Design of instruction
- Production of instructional products and services
- Management of instruction
- Evaluation of instruction

Educational technology reforms education by contributing to:

- Student learning through involvement with challenging tasks.
- Professionalization of teachers
- Creation of a culture that supports learning both in the classroom and beyond it.
- Redefining the roles of teachers and learners.

Educational technology is often considered to be the intermix of two aspects namely, technology of education and technology in education. Technology of education symbolizes a technological approach to education. It is the application of psychology of learning theories, principles of instruction, curriculum and learning to the process of education. In this educationists are involved in the design and evaluation of systems of learning, involving an understanding of the psychology of learning and of communication and information theory to be used to establish a rationale for good teaching. It facilitates a teacher to use a variety of media and modes to make his teaching effective. Technology in education is the application of technology to any process of the educational enterprise. It refers to the use of the technological advancement in terms of various equipment, materials and machines for educational purposes. It involves the increasingly complex range of audio-visual equipment and sophisticated electronic devices like computers LCD projectors and so on for teaching and learning.

Scope and Significance

Educational technology aims to improve the quality of human learning. It is the field involved in applying a complex integrated process to analyze and to solve problems in human learning. The scope of educational technology is unlimited as it tries to reach out to more and more people involved in the teaching-learning process. The scope of educational technology is as follows:

Spelling out the Educational Goals and objectives

- Curriculum Development
- Developing teaching learning materials and resources
- Developing human resources
- Developing tactics and strategies
- Developing multi-sensory aids
- Feedback mechanism and modification
- Develops passive instruction services
- Develops interactive instruction services
- Develops learning environment
- Develops information resources
- Develops communication devices

The aforesaid points are only indicative and are not exhaustive in nature. Moreover they emphasize the significance of educational technology, too.

1.2.2 Possibility of Educational Technology

Educational technology can be considered either as a design science or as a collection of different research interests addressing fundamental issues of learning, teaching and social organization. The Association for Educational Communications and Technology, the professional society for ET, defines it as: Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources. As a field, educational technology emphasizes communication skills and approaches to teaching and learning through the judicious use and integration of diverse media. Scholars in the field examine the uses of innovative media and technologies for education, examining all aspects from direct student learning to management and impacts on institutions.

As in all forms of applied technology, the field studies how theoretical knowledge and scientific principles can be applied to problems that arise in a social context. Practitioners in educational technology seek new and effective ways of organizing the teaching and learning process through the best possible application of technological developments. These activities rely upon a body of knowledge for successful and ethical implementation, rather than routine tasks or isolated technical skills.

Educational technology as practice refers to any form of teaching and learning that makes use of technology. Nevertheless, there are a few features on which most researchers and practitioners might agree:

- Use of technology is principled: Technology means the systematic application of scientific knowledge to practical tasks. Therefore, educational technology is based on theoretical knowledge drawn from different disciplines (communication, education, psychology, sociology, philosophy, artificial intelligence, computer science, etc.) plus experiential knowledge drawn from educational practice.
- Educational technology aims to improve education. Technology should facilitate learning processes and increase performance of the educational system(s) as it regards to effectiveness and/or efficiency.

Educational technology is a very wide field. Therefore one can find many definitions, some of which are conflicting.

- Technology means the systematic application of scientific or other organized knowledge to practical task. Therefore, educational technology is based on theoretical knowledge from different disciplines (communication, psychology, sociology, philosophy, artificial intelligence, computer science, etc.) plus experiential knowledge from educational practice.
- Educational technology is the use of technology to improve education. It is a systematic, iterative process for designing instruction or training used to improve performance. Educational technology is sometimes also known as instructional technology or learning technology.
- The study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources.
- A definition centered on its process: "A complex, integrated process involving people, procedures, ideas,

devices, and organization, for analyzing problems, and devising, implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning"

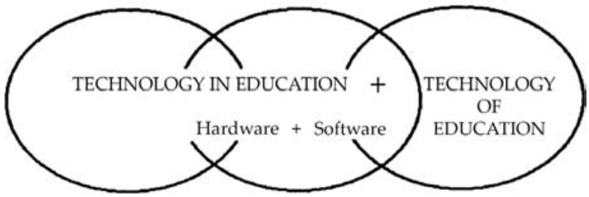
- "One definition of Educational Technology is that it is a systematic, iterative process for designing instruction or training used to improve performance"
- Educational Technology (Information Technology) according to International Technology Education Association
  - Teaches with technology (uses technology as a tool)
  - Primarily concerned with the narrow spectrum of information and communication technologies
  - Primary goal: To enhance the teaching and learning process

1.2.3 Elements of Educational Technology

Educational technology is seen both as a means as well as service to effect and facilitate better and more productive learning systems. It may be defined as a separate field in the theory of education dealing with the development and application of the use of educational resources. Educational Technology should not be confused with teaching or instruction or education or learning or engineering but it should be taken as a sum total of all such aspects which go a long way in shaping the personality of the learner in a meaningful context. It is neither technology in education nor technology of education but both and all pervasive which pervades the whole teaching-learning process to make it meaningful for the teacher who teaches and the learner who learns and modifies his behavior for his own betterment and the betterment of mankind.

Technology refers to the techniques as also the technical contrivances. A systematic way of applying the techniques to achieve an objective is as important as the use of technical equipment for the same. As a matter of fact, techniques are reckoned as the software and the equipment as the hardware of technology.

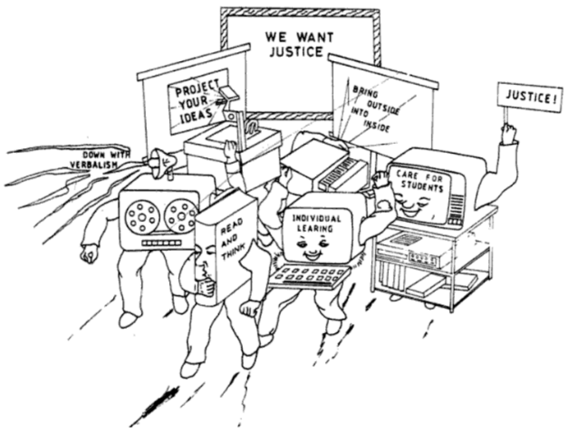
Technology results in new designs and devices as also new ideas and processes. Each new physical device is accompanied by a new set of procedures and techniques. For example, the development of telephone has led to phone books, answering machines, Fax, telephone shopping, etc. The 'hard' component (physical device) may be differentiated from the 'soft' component (methodologies) for the purpose of study. Education, the act or process of acquiring and imparting knowledge, is crucial to the development of a learner with a view to his/her participation in the transformation of the world for a better tomorrow. Learning and understanding are basic to the definition of education.



Educational technology is not a simple combination of these two words. It is usually thought of even more than the sum of the following two interpretations:

1. Technology in education
2. Technology of education

Early developments referred to the role of technology in education which signify the use of audiovisual equipment, i.e., hardware in educational processes. Later developments recognize the concept of technology of education, i.e., techniques and methodologies of the teaching-learning process. This is indeed the software aspect of educational technology. The origin of software is closely associated with the courseware, i.e., instructional design and development of a subject. Use of technology in education results in increased effectiveness of the educational process. Use of technology in training results in increased productivity through enhanced human capability. For example, telephone ex-tends our capability to talk and listen over long distance and automobile extends our capability to travel large distance over short period of time. Overhead projectors extend our capabilities to project a large image of a visual on a screen and slides enable us to capture real-life events and bring them into the classroom. Audiovisuals have been on the move, for quite some time now. They have made an impact in many different situations, e.g., seminars, conferences, extension lectures, meetings, research and project report presentations. Classrooms are also beginning to feel their influence!



Prologue

It is only appropriate to begin by looking at the basic concept as also the general framework of educational technology. As of today, the term Educational Technology connotes a field of study including instructional de-sign, audiovisual media, learning process, teaching strategies and evaluation techniques. Although there is a growing agreement that educational technology should include the subjects of educational psychology, principles of communication, educational management, etc., some educationists continue to ascribe a low profile of mere educational resources to it. Nevertheless, educational technology has come to stay as a discipline with a number of inter-related concepts and applications.

Prerequisites

What can be the prerequisite or a precondition for those willing to peep into the field of educational technology? Just an open mind will do. In fact, it is more like an invitation to all interested to the reception hosted in honor of the new-weds Education and Technology! The couple constitutes an exciting subject to us who have chosen to be in the domain of education. Glimpses of educational technology offered in this module should convert even a non-believer.

Modular Objectives

On studying this module, you will be able to

- Define the term 'educational technology';
- Outline the scope of educational technology;
- Describe a number of related concepts; and
- Differentiate between educational technology and audiovisual aids.

1.2.4 EDUCATIONAL TECHNOLOGY AS A SYSTEM

A 'System' is an assemblage of interconnected and interacting components. All the components which comprise the system are conceptualized to be bounded by an imaginary boundary for the purpose of identifying the sys-tem. The 'region' outside the system boundary represents the conditions under which the system operates; it is referred to as the environment for the system as shown in Figure 1.

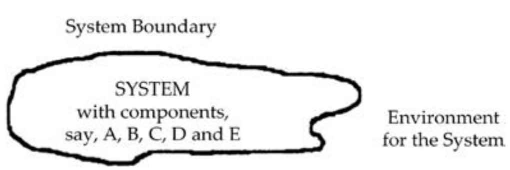


Figure 1: Concept of a system.

One may choose to include any number and size of components to constitute a system for a desired purpose. For example, the entire universe with all the creations of God, Man and the Devil may be considered as a system; a biological cell, a television, a TV tube, an institute, an industry are some further examples of systems. A system may consist of subsystems, which when combined constitute the system. Systems are classified as closed systems and open systems. When a system operates in isolation from the environment, i.e., without any effect or transaction from the environment it is said to be a closed system. On the other hand if a system interacts with the environment by way of some input and output, it is called an open system. The input may consist of raw material information, energy or human beings and the output may be finished products or qualified persons. The purpose of an open system may be to convert the given input into the desired output. In that case, the system is indeed a transformation function, which is either a process or a series of processes. An industry, an institute, and a car engine are examples of open systems. In terms of systems approach, educational technology may be viewed as a system with a number of subsystems and components or elements as shown in Figure 2. Dealing with the interacting subsystems or components of the educational technology system is referred to as the systems approach in dealing with institutional problems and developmental issues. It brings into focus the process and the product orientation of educational technology.

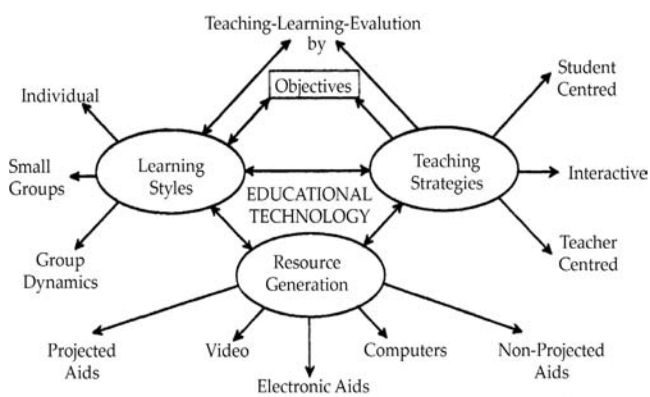


Figure 2: The component of educational development.

The process concept directs our attention to the components of needs assessment, goal analysis, task analysis, curriculum design, and selection of instructional delivery systems, production and utilization of media as also the formative and summative evaluation. The product orientation of educational technology makes reference to the audiovisual devices and hardware. The total system consists of interacting processes and products employed for the desired educational goals. The systems approach helps us to identify the effectiveness and the weak points of subsystems and hence the means through which instructional systems can operate at optimum efficiencies. It is desirable to learn in detail about the subsystems and components of educational technology system before taking up optimization of the whole system.

Systems have some general characteristics:

- A system refers to a collective entity consisting of a group of inter-related and interacting elements.
- A system is a relative concept; it can be a subsystem of a larger system!
- A system may be closed or open-ended.
- All systems are directed to achieve certain goals and outputs under some constraints and with given inputs.
- All systems may be optimized by way of considering the variables alternatives, feedback processes, etc.

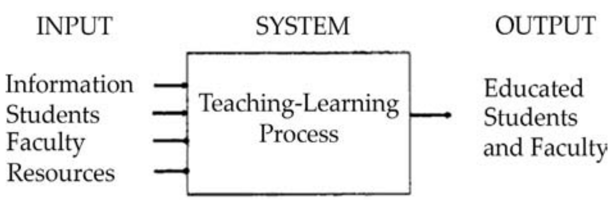


Figure 3: System model of teaching learning process.

A simple systems model of the teaching-learning process is shown in Figure 3. It shows the input, the system and the output. A more detailed system of the teaching-learning-evaluation process of instruction is shown in Figure 4.

Inputs to the system are the entry profile of the student, audiovisual and other resources; the system results in improved exit-profile of students.

It also shows the interaction of elements and the iterative nature of the teaching-learning-evaluation process. The starting point is the learning objectives from which content is derived.

A teaching-learning strategy is identified as also appropriate audiovisual material and other resources are taken in. Learning thus created in students is evaluated. If the learning is short of the objective, the strategy and learning process are re-viewed.

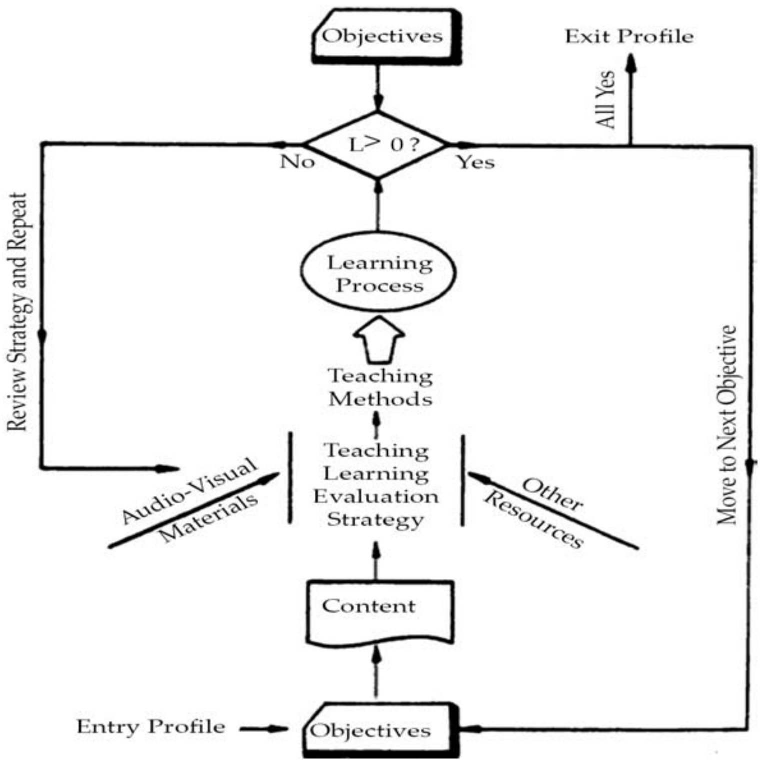


Figure 4: Teaching learning evaluation system.

If the objective is achieved, the next objective is taken up and so on. It may be observed that the objectives play a multiple role in the total process. Content, i.e., subject matter is determined from the objectives; teaching methods and audiovisual resources are identified in view of the intended objectives and finally, the learning outcome of students is measured against the same terminal objectives. System concept of educational technology permits us to optimize the effectiveness of whatever it is applied to Educational technology improves the teaching-learning process in a classroom by way of the following:

- By reducing the time for learning the same thing and increasing the learning outcome over the same time,
- By lowering the percentage dropout and increasing student achievement,
- By decreasing student frustration and by increasing teacher satisfaction.
- Effectiveness of an educational process is not improved merely by the introduction of technology into it. It is, in fact, a function of human skills of employing the technology as also the hardware and software components of technology.

Effectiveness = f(Human skills, software, hardware)

The role of a teacher is characterized by the following four broad functions:

- Planning: establishment of the objectives, preparation of units and schedule of training, etc.
- Organizing: arrangement of the learning resources, utilization of audiovisuals, etc.
- Leading: motivation, encouragement and provision of stimuli to the students in the teaching-learning process.
- Controlling: assessment, feedback and regulation so as to realize the objectives optimally.

These four inter-related functions of a teacher constitute the Teacher as a system as shown in Figure 5.

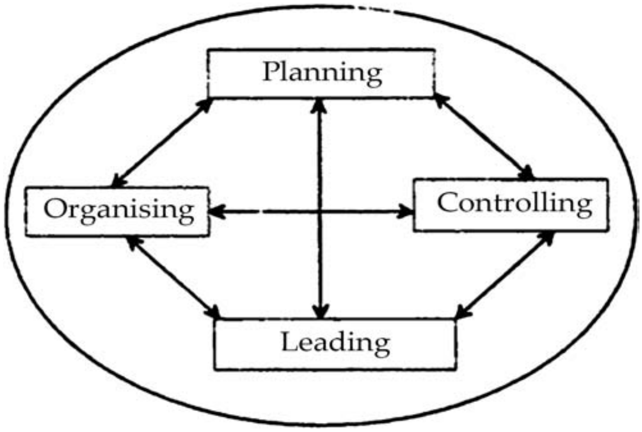


Figure 5: Teacher as a system.

1.3 LEARNING AND EDUCATIONAL TECHNOLOGY

Education, whatever be its goals and objectives, involves learning. Learning is modification of behavior as a result of past experience or prior activity. Behavioral modification arising out of learning may be cognitive, affective, sensorimotor or an amalgam of all these in different proportions.

Human learning may occur at different levels of complexity. Robert M Gagne speaks of signal learning at the base and problem-solving at the apex of the hierarchy. Stimulus-response learning of the Skinnerian type, chaining, verbal association, discrimination learning, concept learning and rule learning are the other middle levels in the hierarchy. Gagne's hierarchy of learning helps the teacher in formulating apt strategies of teaching, taking into consideration the level of learning involved. Often, class instructional objectives may involve a combination of the various categories of learning listed by Gagne. Signal learning, the simplest type recognized by Gagne, refers to the mechanical acquisition of conditioned responses of the Pavlovian type exemplified by a dog learning to salivate at the sound of an electric bell after a sequence of bell-food pairings.

Stimulus-Response learning is akin to the trial-and-error learning conceptualized by the psychologist, E L Thorndike, who, through a variety of experiments with white rats in mazes, pointed out that learning involves elimination of incorrect responses and gradual fixation of correct responses with reference to the goal in question (reaching the food in the food box at the center of the maze) over a period of time and trials. Correct responses leading towards the goal act as positive reinforces. Such stimulus-response bonds get linked serially as a chain, and such a chaining explains the learning of repetitive skills like writing or swimming. When words standing for ideas are joined together to form complex ideas or coherent judgments, we have the next higher category of learning, by verbal association. The next higher place of learning involves discrimination in which the learner is able to respond diversely to stimuli which, though superficially similar in appearance, are really distinct. Concept learning implies a higher level signifying analytical observation of common and essential attributes of a class of objects or ideas leading to unification and generalization from the data of observation. Concept learning involves and includes the other lower levels of learning.

It is the apex of the learning hierarchy in the sense that it involves and is also integrative of the other levels of learning. An analysis of even a simple and concrete problem solving situation, like our trying to locate a book which we have misplaced or lost, would indicate how it implies a variety of learning tasks of different levels of complexity, though all these may be telescoped into one another and may not be openly recognizable. As a corollary of his views on learning, Gagne has listed nine events of instruction pertinent to any effective instructional procedure.

Problem solving makes use of concepts, associates these in the form of judgments, and the process of problem solving as a tool of learning implies inferences of the deductive and inductive nature.

These events are gaining and controlling attention of pupils, informing the pupils of the expected outcomes of learning in clear and specific terms, stimulating recall of relevant necessary capacities and information of the part of pupils, providing feedback and assessing terminal performance, and making provisions for the transferability as well as ensuring retention of learned behavior. These tasks which look at instruction from the teacher's point of view can be translated into class routine by six possible modes of instruction, viz, tutoring, lecturing, recitation, participatory discussion. Laboratory and field work and home assignments. These modes of instruction may make use of different media such as oral communication, pictures, and films etc. In any mode of instruction, the teacher may utilize one or more media to enhance the nature of communication, retention and innovative application of ideas presented. Educational technology helps in the choice of effective media to suit the instructional mode, which in turn has to be determined taking into consideration the parameters of pupil characteristics, instructional objectives, learning tasks involved as well as the teaching style of individual teachers.

Instruction leading to learning may be in groups or individualized. Individualized programs consist of learning experiences specifically designed for the individual pupil on the basis of diagnostic procedures employed to determine individual interests and needs. Individual differences which may concern personality variables like traits and temperament, cognitive variables such as IQ and specific abilities, inquiry variables like curiosity, experimental attitude, etc., and sequencing variables involving random or logical sequencing of instructional information, demand individualization of learning. Whatever be the level of learning or type of learning, the basic learning experiences or the inputs of learning have to reach the pupil through his senses. As such the senses along with the intellect are vital to learning. In one way senses appear to be even more important than cognitive interpretative abilities for learning as there could be nothing in the intellect which has not been transmitted through the senses. Mental interpretation comes after sensory inputs are received. Our senses arc the gateways to acquiring knowledge. These receptive mechanisms vary in their functions as much as the individuals themselves. The receptive mechanisms feed us the necessary data, the sensory impressions.

The natural way of learning by children is principally through the employment of senses. If a new object is given to the child, the child makes sounds with the object, bites it and tastes it, looks at it closely and slowly learns about the object by making use of its senses. This is the reason for emphasizing sense training in Montessori Method.

1.3.1 Sense of Sight

Of all the senses, sense of sight is most vivid and provides rich experiences to the individual. Nearly 80% of the experiences that a person gains in this world are received through this particular sense. People who have lost the power of this sense, generally compensate to a very large degree by the tactile sense. Impressions created by the sense of sight cannot easily be effaced. A 'visual' will not only attract the attention of pupils but also hold it for as long as it appeals to the sense of sight. Visual experiences are also more elective than verbal experiences. Although the learning process uses the senses as avenues to reach our minds, it is important which sense is used to conduct the message. Experience and research have shown that the following figures are generally valid.

We learn

1.0 % through TASTE

1.5 % through TOUCH

3.5 % through SMELL

11.0 % through HEARING

83.0 % through SIGHT

We remember

20 % of what we HEAR

30 % of what we SEE

50 % of what we SEE AND HEAR

80 % of what we SAY

90 % of what we SAY AND DO.

The importance and superiority of visual impressions and their interpretation over other sensory channels of information are exemplified today in the stress on what is referred to as visual literacy. Visual literacy refers to a group of "vision competencies" one can develop by seeing and at the same time hearing and integrating other sensory, verbal and learning experiences. Visual literacy training, if given to young pupils, will induce motivation and skills in them in expressing themselves first in visual terms and later in spoken and written language. John L Debes, in explaining the concept of visual literacy, remarks that competencies associated with visual literacy are fundamental to normal human learning. When developed they enable a normally literate person 'to discriminate and interpret the visual actions, objects and symbols that he encounters in his environment'.

Through the creative use of these competencies he is able to communicate with others and comprehend, appreciate and master works of visual communication. The following competencies appear to be involved in visual literacy: to read visuals with skill, to write with visuals expressing oneself effectively, to be familiar with the tools of visual literacy and their use, to appreciate the master works of visual literacy and to be able to translate from visual and verbal language and vice versa. Visual literacy appears to have special benefits not only for those with limited verbal skills but is also equally useful for verbally competent and articulate students. The various components of educational technology such as still pictures, drawings, graphics, displays, demonstrations, etc., are all tools and channels of visual literacy.

1.3.2 Perception and Formation of Concepts

Perception refers "to the way in which man senses or becomes immediately aware of his environment". Although knowledge about the world is gained through the senses, impressions themselves are not enough to give a suitable understanding of the object perceived. It is the brain that receives the impressions and interprets them, which then become organized into meaningful understanding. Thus, any given perceptual event is the result of multiple sensory messages. Perceptual events do not occur in isolation; they are continuous. As a result of constant sensory stimulation, experiences are arranged and rearranged, shuffled and reshuffled, selected and re-selected and organized into a convenient combination of patterns. This process finally leads to formation of concept. In general, the understanding of the things and events of the world is based on sensory experiences and the physical objects, as we know them, are products of our own sensory perceptions. !fence the process of understanding must begin with perception. Or in other words, conceptualization has its basis in concrete experiences. Where the concrete basis for abstract conceptualization is lacking, acquisition of the concept by the individual is inadequate or may not take place at all. This is the reason for emphasizing maximum concretization through materials and multimedia at the lower levels of education so that it will lead to better abstractions in the higher courses. Without a sufficient conceptual foundation, the learning process is impaired and the thinking process is also very much affected.

1.3.3 Value of One Sense over Another

A problem may be raised regarding the effectiveness of a particular sense over the others. Actually, our sensory experiences are mixed. When we listen to the teacher, we are not only getting the aural experience but also observe his facial and body gestures. The characteristics of a particular object may be studied completely by not only making sounds, but also observing its physical features including the weight, smell, color, etc. So long as our sensory mechanisms are functioning normally, we learn quite as readily through one sense as another. The teacher must determine which method of presentation is to be preferred by the particular age-group. The relative values of the various aids must be analyzed while deciding to use any one. The aid must make the point clear to the learner interestingly, with economy of time.

Multi-Sensory Approach Monotony can be a powerful deterrent to learning. In a typical classroom, we find the teachers talking to an ebullient group of children all the time. It has been recognized that students grasp ideas better through concrete aids like pictures, diagrams, practical work, demonstrations, field trips and the like. In the absence of these various aids that appeal to the senses, children fluid the school work dull and dreary and hence these may also cause them to drop out of school. Further, to meet the individual differences in a classroom, the teacher must resort to various types of aids that appeal to the different senses. Even among the aids, there are quite a lot of them which appeal to two or more senses simultaneously.

1.3.4 Audio-Visual Aids

Almost every educational reformer has expressed deep concern over the excessive use of words that carry the shadow of meaning but not the substance. Several educationists have struggled to make education realistic. About three centuries ago, .1 A Comenius prepared the first "visualized" textbook which contained some 150 pictures. "Let the pictures be a source of delight to the children and let them become familiar with them before they enter school," was his theory. Later J J Rousseau criticized the teaching of his days and condemned the liberal use of words by teachers. Rousseau's theory was put into action by Pestalozzi in his 'object method'. He became interested in basing instruction on sense perception. Although attempts on the use of concrete aids were made sporadically, intensive development in audio-visual education has started only recently, in the twenties of this century. Educators investigated the possibility of using motion films and by 1929 sound films were being produced. A further impetus to the movement was given during the Second World War when the armed forces suddenly faced teaching tasks of staggering proportions. Today it has been proved beyond doubt by research and classroom experience that audio-visual aids can contribute effectively in teaching.

Audio-visual aids are the different types of tools that appeal to the sense of hearing and vision and are used in classrooms for presentation of a variety of information. These materials may be used to convey meaning without complete dependence on verbal symbols or language. Thus, according to such a definition, a textbook does not fall under the category of audio-visual grouping of instructional materials, but a textbook illustration does. Some audio-visual activities, like going on a field trip, dramatizing an event in history, or demonstrating an experiment, are in the nature of process or experiences. Some like motion film or filmstrip need a projector to handle it. Some others, like a chart, a photograph or a picture, need no equipment and can be directly used. Experiences of this type will be classified under visual category. Magnetic tape or disc recordings belong to audio category. Hence the term 'audio-visual aids' designates in common usage both processes and material things.

Educators now often refer to the field of audio-visual education as 'educational communication technology', audio-visual media', 'learning resources', and 'instructional or educational media'. The terms 'A V materials', 'instructional media' or 'educational media' mean the same thing. All these are implied by the term Media generally. More specifically 'media' refers to films, filmstrips, recordings, etc., and programmed instruction, computer assisted instruction, and educational TV are designated as Methods. The replacement of the older and perhaps more familiar term 'Audio-visual materials in education' by the newer term Educational Technology or Instructional Technology is mainly due to the dynamic expansion of the field of A V education and the exciting new developments that promise much more for the future. The main objective of the use of educational technology is the improvement of learning. However, this purpose can be fully achieved only when the vital role of the individual teacher in adding the necessary human, personal factors necessary for the best use of technological hard and software is understood.

1.3.5 Media and Methods of Teaching

The teacher practitioner is often puzzled when he is introduced to the many types of audio-visual aids available to him. Too often the novice in the art of teaching looks upon the hardware of educational technology as a convenient substitute for professional planning and competency. So, even at the outset, it should be made clear to the young teacher that different media and methods are suitable for realizing different learning outcomes, that the effectiveness of aids depends not only on the material provided but also on the techniques used and that the ability and resourcefulness of the teacher is as important in the classrooms of today as it was in the traditional classrooms. For some instructional objectives the chalkboard will suffice; for some others a brief lecture correlated with a suitable and simple demonstration will be enough; while for realizing certain other learning outcomes the overhead projector or the sound film projector may be apt. "As new devices are developed, it is quite common for each to be heralded as the panacea for educational ills." The overhead projector, the teaching machine and the educational TV have all had their day. However, the fact remains that the teacher must determine how each device can uniquely serve his specific teaching needs.

Competence in the art and craft of classroom instruction requires mastery of many methods and modes of communicating information and influencing pupil's behavior. These include not only the special techniques associated with the teaching of specific subjects but also general organizational strategies needed for running the classroom: keeping order, facilitating communication, catering to individual differences among pupils, etc. New instructional methods develop from different sources such as psychological research, pedagogical theory, academic disciplines, outgrowth of teacher's ideas and experiences, impressions of how learning ought to occur. Whatever be the source and whatever be the nature of instructional method adopted.

1.3.6 Integrated Use of Teaching Aids

In planning their instructional strategy, teachers have to select the most suitable teaching aid or aids, sometimes even designing and fabricating them if not readily available. The following steps indicate the flow in procedure for use of aids most suitable for promoting the desired learning outcomes in pupils: (a) awareness of intended learning outcomes and definition of these in observable behavioral terms; (b) selection of apt and suitable aids taking into consideration the following—entry behavior of pupils, anticipated terminal behavior of pupils, the strength of the class (small groups—about 20-25 pupils and large groups—more than 25), materials readily available and facilities available for fabrication of needed or innovated aids, facilities available in the classroom for using these (e.g., hanging facilities for charts, darkening facilities, power supply, projection screen, ventilation, etc. if a projected aid is planned for use); (c) getting ready for use the chosen aid or aids; (d) deciding upon the commentary to be given while using these aids and the specific aspects to be kept in view; (e) deciding upon the questions to be posed and other evaluation procedures to be used; and (f) deciding upon the follow-up work to be given to pupils for consolidating the resulting learning outcomes and to enable the pupils to apply the knowledge gained to real-life situations, through assignments, construction projects, etc. While using aids, (he pupils should be informed as to what to observe. Similarly, when a demonstration is conducted the pupils should be trained to observe it, posing to themselves such questions as what is happening. When does it happen? Why does it happen? Etc. A good teacher, even while planning any lesson, should think of the teaching aids results in making class instruction dynamic and effective.

Summing up, it can be said that instructional efficiency is enhanced by the use of appropriate media, and the teacher, to get the best out of media, has to exercise his judgment and innovative skills in his choice. The first step in such an exercise is perhaps to eliminate media that may not, for one reason or other, suit the teacher's purpose, and then make a specific choice of suitable medium or media based on rational considerations from among those left over. When more than one medium is chosen for a unit of instruction, the use of these has to be suitably coordinated while planning instruction. In media selection the structure of the subject-matter as well as the specific objectives of instruction form the basis of selection. These, coupled with such factors as the teacher's skill in adaptability and innovation, and the entering characteristics of the pupils, help in media selection. The class size is also a constraint as certain media are suitable only for use with small groups. Other factors such as time available, classroom material facilities, availability of media as well as its cost effectiveness, suitability of software in terms of specific teaching goals, also have to be borne in mind. Media only help in expanding and enlarging the influence of the human element in education and the role of the teacher continues to be a central factor in the instructional process in spite of the tremendous potentialities of educational hard and software.

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CHAPTER 2

PSYCHOLOGICAL BASES OF MODERN TECHNOLOGY

INTRODUCTION

Information is the lifeline of the digital age and 21st century in shaping itself in the Knowledge Economy at a breath-taking pace. People now have the power to learn on their own time and at their pace with the enormous resources around them. The development of the user-friendly computer networks, internet, multimedia, online instruction, satellite and other high-end ICT peripherals have enhanced the usage of this technology in education.

Educational psychology is one of the branches of applies psychology concerned with the application of the principles, techniques and other resource of psychology to the solution of the problems confronting the teacher attempting to direct the growth of children toward defined objectives. More specifically, we can say educational psychology is concerned with an understanding of:

- The child, his development, his need and his potentialities.
- The learning situation including group dynamics as the affect learning.
- The learning process its nature and the ways to make it effective. Stated differently, the Central theme of Educational Psychology is Psychology of learning.

2.1 MEANING, NATURE AND SCOPE OF EDUCATIONAL PSYCHOLOGY

Educational psychology is the branch of psychology that deals with the scientific study of human learning. The study of learning processes, both cognitive and behavioral, allows researchers to understand individual differences in intelligence, cognitive development, motivation, self-regulation, self-concept, affect, and personality, as well as their role in learning. The field of educational psychology relies heavily on quantitative methods, including testing and measurement, to enhance educational activities related to instructional design, classroom management, and assessment, which serve to facilitate learning processes in many educational settings across the lifespan.

The field of educational psychology involves the study of memory, conceptual processes, and individual differences (via cognitive psychology) in conceptualizing new strategies for learning processes in humans. Educational psychology has been built upon theories of Operant conditioning, functionalism, structuralism, constructivism, humanistic psychology, Gestalt psychology, and information processing.

2.1.1 History

The word, 'Psychology' is derived from two Greek words, 'Psyche' and 'Logos'. Psyche means 'soul' and 'Logos' means 'science'. Thus psychology was first defined as the 'science of soul".

Early Years

Educational Psychology is a fairly new and growing field of study. Though it can date back as early as the days of Plato and Aristotle, it was not identified as a specific practice. It was unknown that everyday teaching and learning in which individuals had to think about individual differences, assessment, development, the nature of a subject being taught, problem solving, and transfer of learning was the beginning to the field of educational psychology. These topics are important to education and as a result it is important to understanding human cognition, learning, and social perception.

Plato and Aristotle

Educational psychology dates back to the time of Aristotle and Plato. Plato and Aristotle researched individual differences in the field of education, training of the body and the cultivation of psycho-motor skills, the formation of good character, the possibilities and limits of moral education. Some other educational topics they spoke about were the effects of music, poetry, and the other arts on the development of individual, role of teacher, and the relations between teacher and student. Plato saw knowledge as an innate ability, which evolves through experience and understanding of the world. Such a statement has evolved into a continuing argument of nature vs. nurture in understanding conditioning and learning today. Aristotle observed the phenomenon of "association." His four laws of association included succession, contiguity, similarity, and contrast. His studies examined recall and facilitated learning processes.

John Locke

John Locke followed by contrasting Plato's theory of innate learning processes. Rather, he introduced the term "tabula rasa" meaning "blank slate." Locke explained that learning was primarily understood through experience only, and we were all born without knowledge. Locke introduced this idea as "empiricism," or the understanding that knowledge is only built on knowledge and experience.

Before 1890

Philosophers of education such as Juan Vives, Johann Pestalozzi, Friedrich Fröbel, and Johann Herbart had examined, classified and judged the methods of education centuries before the beginnings of psychology in the late 1800s.

Juan Vives

Juan Vives (1493–1540) proposed induction as the method of study and believed in the direct observation and investigation of the study of nature. His studies focus of humanistic learning, which opposed scholasticism and was influenced by a variety of sources including philosophy, psychology, politics, religion, and history. He was one of the first to emphasize that the location of the school is important to learning. He suggested that the school should be located away from disturbing noises; the air quality should be good and there should be plenty of food for the students and teachers. Vives emphasized the importance of understanding individual differences of the students and suggested practice as an important tool for learning.

Johann Pestalozzi

Johann Pestalozzi (1746–1827), a German educational reformer, emphasized the child rather than the content of the school. Pestalozzi fostered an educational reform backed by the idea that early education was crucial for children, and could be manageable for mothers. Eventually, this experience with early education would lead to a "wholesome person characterized by morality".

Johann Herbart

Johann Herbart (1776–1841) is considered the father of educational psychology. He believed that learning was influenced by interest in the subject and the teacher. He thought that teachers should consider the students existing mental sets, what they already know, when presenting new information or material. Herbart came up with what is now known as the formal steps. The 5 steps that teachers should use are:

- Review material that has already been learned by the teacher
- Prepare the student for new material by giving them an overview of what they are learning next
- Present the new material.
- Relate the new material to the old material that has already been learned.
- Show how the student can apply the new material and show the material they will learn next.

1890–1920

William James

The period of 1890–1920 is considered the golden era of educational psychology where aspirations of the new discipline rested on the application of the scientific methods of observation and experimentation to educational problems. From 1840 to 1920, 37 million people immigrated to the United States. This created an expansion of elementary schools and secondary schools. The increase in immigration also provided educational psychologists the opportunity to use intelligence testing to screen immigrants at Ellis Island. Darwinism influenced the beliefs of the prominent educational psychologists. Even in the earliest years of the discipline, educational psychologists recognized the limitations of this new approach. The pioneering American psychologist William James commented that:

Psychology is a science, and teaching is an art; and sciences never generate arts directly out of themselves. An intermediate inventive mind must make that application, by using its originality".

2.1.2 Nature of Educational Psychology

Its nature is scientific as it has been accepted that it is a Science of Education. It combines two fields i.e. education and psychology. We can summarize the nature of Educational Psychology in the following ways:

Educational Psychology is a science.

(Science is a branch of study concerned with observation of facts and establishment of verifiable general laws. Science employs certain objective methods for the collection of data. It has its objectives of understanding, explaining, predicting and control of facts.) Like any other science, educational psychology has also developed objective methods of collection of data. It also aims at understanding, predicting and controlling human behavior.

Educational Psychology is a natural science.

An educational psychologist conducts his investigations, gathers his data and reaches his conclusions in exactly the same manner as physicist or the biologist.

Educational psychology is a social science.

Like the sociologist, anthropologist, economist or political scientist, the educational psychologist studies human beings and their sociability.

Educational psychology is a positive science.

Normative science like Logic or Ethics deals with facts as they ought to be. A positive science deals with facts as they are or as they operate. Educational psychology studies the child's behavior as it is, not, as it ought to be. So it is a positive science.

Educational psychology is an applied science.

It is the application of psychological principles in the field of education. By applying the principles and techniques of psychology, it tries to study the behavior and experiences of the pupils. As a branch of psychology it is parallel to any other applied psychology. For example, educational psychology draws heavily facts from such areas as developmental psychology, clinical psychology, abnormal psychology and social psychology.

Educational psychology is a developing or growing science.

It is concerned with new and ever new researches. As research findings accumulate, educational psychologists get better insight into the child's nature and behavior.

W.A. Kelly (1941) listed the nature of Educational Psychology as follows:

- To give a knowledge of the nature of the child
- To give understanding of the nature, aims and purposes of education
- To give understanding of the scientific methods and procedures which have been used in arriving at the facts and principles of educational psychology

- To present the principles and techniques of learning and teaching
- To give training in methods of measuring abilities and achievement in school subjects
- To give a knowledge of the growth and development of children
- To assist in the better adjustment of children and to help them to prevent maladjustment
- To study the educational significance and control of emotions and
- To give an understanding of the principles and techniques of correct training.

Thus, educational psychology is an applied, positive, social, specific and practical science. While general science deals with behavior of the individuals in various spheres, educational psychology studies the behavior of the individual in educational sphere only.

2.1.3 Scope of Educational Psychology

Scope of educational psychology tells us the areas of application. In other words, it can be called the subject matter of educational psychology.

1. Human Behavior. It studies human behavior in the educational context. Psychology is the study of behavior and education aims at modification of behavior. Hence the influence of Educational Psychology has to be reflected in all aspects of education.
2. Growth and development. It studies the principles governing growth and development. The insight provided by the study will help in scientifically planning and executing learner oriented programmes of education.
3. The Learner. The subject-matter of educational psychology is knitted around the learner. Therefore, the need of knowing the learner and the techniques

of knowing him well. The topics include – the innate abilities and capacities of the individuals, individual differences and their measurements, the overt, covert, conscious as well as unconscious behavior of the learner, the characteristics of his growth and development and each stage beginning from childhood to adulthood.

4. The Learning Experiences. Educational Psychology helps in deciding what learning experiences are desirable, at what stage of the growth and development of the learner, so that these experiences can be acquired with a greater ease and satisfaction.
5. Learning process: After knowing the learner and deciding what learning experiences are to be provided, Educational Psychology moves on to the laws, principles and theories of learning. Other items in the learning process are remembering and forgetting, perceiving, concept formation, thinking and reasoning, problem solving, transfer of learning, ways and means of effective learning etc.
6. Learning Situation or Environment. Here we deal with the environmental factors and learning situations which come midway between the learner and the teacher. Topics like classroom climate and group dynamics, techniques and aids that facilitate learning and evaluation, techniques and practices, guidance and counselling etc. For the smooth functioning of the teaching-learning process.
7. Evaluation of learning process: Some forms of evaluation inevitable in teaching. Also in all fields of activity when judgments used to be made, evaluation plays an important role. Even when we want to cross a road we make a judgment whether it is safe to cross the road. Effectiveness of learning process always depends on the evaluation as it gives the knowledge of result which helps the learner as well as the teacher to modify or correct oneself. Educational psychology guides are by explaining the different methods of assessment contributing to the

effectiveness of learning process. Knowing the learner, acquiring the essential skill in teaching and evaluation are the focal points in the study of educational psychology.

8. Individual differences. It is universally accepted that every individual differs from every other individual. This idea has been brought to light by Educational Psychology.
9. Personality and adjustment. Education has been defined as the all-round development of the personality of an individual. If educational has to fulfil this function all instructional programmes have to be based on the principles governing the nature and development of personality.
10. The Teacher: The teacher is a potent force is any scheme of teaching and learning process. It discusses the role of the teacher. It emphasizes the need of 'knowing thyself' for a teacher to play his role properly in the process of education. His conflicts, motivation. Anxiety, adjustment, level of aspiration etc. It throws light on the essential personality traits, interests, aptitudes, the characteristics of effective teaching etc. so as to inspire him for becoming a successful teacher.
11. Guidance and Counselling. Education is nothing by providing guidance and counselling required for the proper development of the child. This is very true, especially in the light of the extremely complex and problematic situation one has to face in the fast growing world. Educational psychology has come to the rescue by developing principles and practical measures helpful for providing effective guidance and counselling.

We can conclude by saying that Educational Psychology is narrower in scope than general psychology. While general psychology deals with the behavior of the individual in a general way, educational psychology in concerned with the behavior of the learner in an educational setting.

2.1.4 Relevance of Educational Psychology for Teachers

Educational psychology has contributed considerably to the creation of the modern system of education. The knowledge of educational psychology helps the teacher in the following ways:

1. To understand the Stages of Development: Psychology has clearly shown that human life passes through different stages of development before it reaches adulthood. They are infancy, childhood, adolescence and adulthood. Psychologists have also thoroughly studied the characteristic behavior patterns in these different periods of life. Identification of these periods with different sets of characteristics and attributes as regards physical, mental and emotional development greatly help educationists to design curriculum and determine appropriate methods of teaching for students at different stages.
2. To Know the Learner: The child or the learner is the key factor in the teaching-learning process. Educational psychology helps the teacher to know his interests, attitudes, aptitudes and the other acquired or innate capacities and abilities; to know the stage of development linked with his social, emotional, intellectual, physical and aesthetic needs; to know his level of aspiration, his conscious and unconscious behavior; his motivational and group behavior; his conflicts, desires and other aspects of his mental health. So that perfect guidance and help can be provided and positive attitude towards the learner can be formed.
3. To Understand the Nature of Classroom Learning: Educational Psychology helps the teacher to adapt and adjust his teaching according to the level of the learners. A teacher is teaching in a class but a large number of students do not understand the subject-matter which is being taught. To deal with the students effectively in the class the teacher must have the knowledge of the various approaches to the learning process, principles, laws and

factors affecting it then only he/she can apply remedial measures in the learning situation.

4. To Understand the Individual Differences: No two persons are exactly alike. Pupils differ in their level of intelligence, aptitudes, likes and dislikes and in other propensities and potentialities. There are gifted, backward, physically and mentally challenged children. Thus, psychology tells the teacher about the individual differences among the students in the class and the procedure, methodology and techniques to be adopted for them.
5. To Solve Classroom Problems: There are innumerable problems like truancy, bullying, peer pressure, ethnic tensions, cheating in tests etc. Educational Psychology helps to equip the teacher by studying the characteristics of the problem children, the dynamics of the group, behavioral characteristics and adjustments.
6. To develop Necessary Skills and Interest in Teaching: Educational psychology helps the teacher to acquire and develop necessary qualities and skills to deal with the problems created by the pupils, maintain a healthy atmosphere in the classroom and show concern regarding the progress of the child.
7. To Understand Effective Methods of Teaching: Educational Psychology has discovered several new approaches, principles. Methods and techniques of teaching which are very helpful in today's teaching-learning process. Educational psychology tells us how significant play and recreation are for the children and how play-way methods turn learning into an interesting task.
8. To Understand the Influence of Heredity and Environment on the Child: Educational psychology helps the teacher to know that the child is the product of heredity and environment. They are the two sides of a coin. Both play a prominent part in the all-round development of the child. While the child is born with

a number of hereditary qualities, environment helps them to be modified according to the requirements of the society.

9. To Understand the Mental Health of the Child: Educational Psychology helps the teacher to know what are the factors responsible for the mental ill-health and maladjustment of a student and to suggest improvement thereof. Besides this, it also provides the teacher with necessary insight to improve his own mental status to cope up with the situation.
10. To Understand the Procedure of Curriculum Construction: Curriculum is an integral part of the teaching-learning process. Curriculum should be child-centered and fulfil the motives and psychological needs of the individual because child capacities differ from stage to stage. Educational psychology helps the teacher to suggest ways and means to curriculum framers to prepare sound and balanced curriculum for the children.
11. To Provide Guidance and Counselling: Today guidance to a child at every stage of life is needed because psychological abilities, interests and learning styles differ from person to person. Similarly, what courses of study the child should undertake in future is also a vital question. All these can be answered well if the teacher knows the psychology of children.
12. To Understand Principles of Evaluation and Assessment: Evaluation is an integral part of the teaching-learning process. How to test the potentialities of the child depends upon the evaluation techniques. The development of the different types of psychological tests for the evaluation of the individual is a distinct contribution of educational psychology.
13. To inculcate Positive and Creative Discipline: The slogan of the traditional teachers was "spare the rod and spoil the child." Flogging the child was the chief instrument. Educational Psychology has replaced the repressive

system with the preventive system. Now teachers adopt a cooperative and scientific approach to modify the behavior of the students. Emphasis is laid on self-discipline through creative and constructive activities.

14. Educational Psychology and Research: Educational psychologists conduct research to improve the behavior of human beings in the educational situation. For this purpose it helps in developing tools and devices to measure the performance and suggest remedial measures thereof.
15. To Know Himself/Herself: Educational Psychology helps the teacher to know about himself/herself. His/her own behavior pattern, personality characteristics, likes and dislikes, motivation, anxiety, conflicts, adjustment etc. All this knowledge helps him in growing as a successful teacher.
16. Educational Psychology Helps in Professional Growth, Changing Attitude and Innovative Thinking: Inside the classroom, educational psychology has enabled the teacher to achieve proper conditioning of pupils by achieving and directing classroom programmes on human lives. Not only this, educational psychologists are busy in finding out innovations in the field of education. These innovations will bring about professional growth of the teacher.

2.2 INSTRUCTIONAL DESIGN

Instructional design (ID) is a combination of two words 'instruction' and 'design'.

Instruction is "the deliberate arrangement of learning conditions to promote the attainment of some intended goal". According to Heinich (1999), "Instruction is the arrangement of information and environment to facilitate learning", where environment covers place of instruction, methods, media and equipment's, etc., that guide a student's learning. In other words, instruction is goal, directed teaching which has been more or less pre-planned.

An instructional designer must answer the following while preparing a blueprint for designing instruction:

- Who (are the learners; their structure and groupings); and
- When (the sequence of events that should occur);
- How (the strategies, methods and media should be used);
- What (instruments and strategies to be used for assessment).

Designing of instruction involves four stages:

(i) Analysis of content and specification of instructional objectives pertaining to a unit/course/programme;

(ii) Specification of the role of distance learners (types of learning tasks set for learners; the degree of learner control over the content; and learner's role as a processor, performer, and problem solver);

(iii) Intervention of an instructional designer (discussion with academics, faculty, coordinators, graphic artists and media specialists);

(iv) Preparation of Instructional materials [types and format (print, audio, video, computer based) and other learning resources]. In this stage, instructional events are designed keeping in view the enabling objectives. Instructional steps are also planned in detail to write out some script or learning material. This is a transactional activity.

As distance teachers or Instructional Designers/ODL Specialists, we are concerned with instructional design in one or more of the above levels at any point of time. We take part in course design, prepare annual training plans, organize counselling sessions, and prepare learning materials. In all these activities, we are involved in instructional design at different levels. Instructional design provides a valuable framework for effective instruction that focuses on the distance learner's needs, creates the instructional specifications and evaluates whether the instruction is effective.

2.2.1 Purposes of ID

The purposes of ID are:

1. To design instructional activities/events systematically (step by step) beginning with a basis of information to achieve identified objectives
2. To cater to the needs of an individual distance learner
3. Cost effective use of Information and Communication Technology (ICT)
4. Effective use of pre-produced courses/programmes to facilitate individual learning
5. To promote organized two-way communication between the distance learners and organizations.

2.2.2 Tasks Involved in Instructional Design

Andrews and Goodson (1980) lists the following fourteen common tasks in instructional design.

1. Assessments of needs, problem identification, occupational analysis, competence or training requirements.
2. Consideration of alternative solutions to instruction.
3. Formulation of systems and environmental descriptions and identification of constraints.
4. Formulation of broad goals and detailed sub-goals in observable terms.
5. Development of pre-test and post-test matching goals and sub-goals.
6. Analysis of goals and sub-goals for types of skills / learning required.
7. Sequencing of goals and sub-goals to facilitate learning.

8. Analysis of learner population in terms of their age, grade level, entry behavior, goals, etc.
9. Formulation of instructional strategy to match subject-matter and learner requirements.
10. Selection of media to implement strategies.
11. Development of courseware based on strategies.
12. Empirical testing of courseware with learner population, evaluation and revision.
13. Development of materials and procedures for installing, maintaining, and periodically repairing the instructional program.
14. Costing instructional programmes.

2.2.3 Theories and Models of Instructional Design

In the context of Instructional Design (ID):

- A theory is a set of models and in the case of prescriptive theory, a set of prescriptions as which model will optimize given desired outcomes under given conditions.
- What is a prescriptive theory? A prescriptive instructional theory, mediated through an instructional model, becomes a more explicit guide to practice. Its prescriptions are the subject of applied evaluation. The evaluation of instructional materials can serve as a guide to the modification of instructional model.
- What is a descriptive theory? A descriptive theory… is meant to identify specific types of treatments that can, under specific types of conditions, bring about specific types of changes in performance.

2.2.4 Characteristics of ID Models

There are also certain characteristics of these models and theories that are used for classification.

These characteristics are:

- Amount of preliminary analysis conducted
- Identification of objectives
- Analysis and Sequences of objectives
- Typical output in terms of amount of instruction prepared
- Analysis of subject matters
- Quantification of conditions and treatment
- Compatibility with theories of learning
- Resources committed to the development efforts
- Team or individual effort
- Instructional design skills experience expected from individual or team members
- Technical complexity anticipated in the development and learning environment
- Amount of tryout and revision; and
- Dissemination and follow up afterwards.

2.2.5 Gagne's Nine Steps of Instruction

The nine steps of instruction that can be best implemented for designing the learning steps. Gagne Termed these steps, as instructional events, This linear model is like connecting blocks - one leading to the other. The steps are given below.

1. Gain Attention: In order to help the learners learn better, it is important to gain their attention. Some of the ways to grab the attention of the learners are storytelling, demonstration, presenting a challenging problem, doing something differently.
2. Inform the learner of the objectives: Informing learners about the objectives is to let the know in advance what is expected of them at the end. Also, it is a cue to the instructor to tell what he/she will tell and then tell them, and again review them at the end.

3. Stimulate recall of prior learning: Concepts, methods, processes learnt earlier and pre-requisite as to learning new concepts, methods, processes should be recalled before new learning can occur. The instructor needs to do this by asking questions, by stating the concepts or by simply doing a review of what has been learnt so far.
4. Present the learning material: Information is presented to the learner in small chunks from simple to complex sequence.
5. Provide guidance for learning: This step is to allow the learners to comprehend and assimilate the materials presented. Thus, the instructor needs to facilitate learning by providing guiding steps.
6. Elicit performance: In this step, the instructor asks questions to elicit learners' understanding of the material presented.
7. Provide reinforcement: This is to check whether the learners' performance is correct or wrong. In this stage, specific feedback should be provided.
8. Assess performance: This step is different from step 6. Here the terminal evaluation of the achievement of objectives is done using some kind of tests.

2.2.6 Banathy's Design of Instructional Systems

The instructional design theory of B.H. Banathy is one of the earliest theories, proposed in 1976. This theory places a lot of importance on detailed statement of purpose that will lead to development of the system. The system emphasizes clearly stated objectives, analysis of entry behavior of the learner and testing. Figure 1 depicts the ID theory proposed by Banathy, where the following steps are involved:

- Analysis and formulation of objectives: The first step is to clearly write down the purpose of the system and then outline what the learners are expected to do as a result of the instruction.

- Criterion test: Prepare criterion-reference tests to measure the achievement of the objectives.
- Analysis and formulation of learning tasks: Prepare a list of learning tasks that the learners must undertake to accomplish the objectives. In this step, the following activities are done:
  - assess the entry behavior through input test so that learners do not have to learn again what they already know; and
  - identify the learning tasks to be undertaken.
- Design the system:
  - identify the process that will lead to mastery learning
  - analyze how best these can be achieved; and
  - identify the time and place the functional training has to be conducted.
- Implementation: This is the stage of implementation of the training and evaluating the achievement of the performance of the learners. The results of the evaluation shall determine necessary changes to be done in other components of the system.

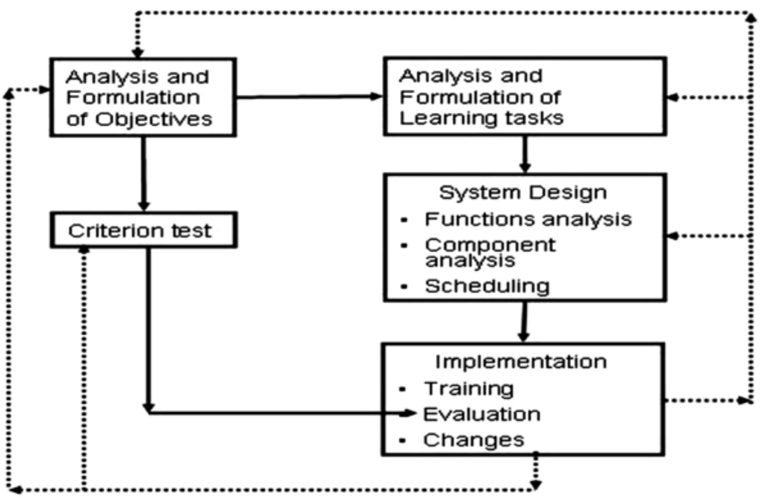


Figure 1: Banathy's Design of Instructional System.

2.2.7 Keller's Motivational Design of Instruction

John M. Keller proposed that there are four basic categories of motivational conditions that instructional designers must understand. These conditions are attention, relevance, confidence, and satisfaction, often called the ARCS model (Keller, 1979). Figure 2 depicts the model where the first step is to analyze the motivational problem in terms of the instruction and the student. The next step is to design motivational strategies, which is followed by implementation and evaluation. In the motivational strategy design, 'attention' can be gained in two ways – arousing curiosity of the learner, and using surprises or uncertainty to gain interest. Some of the strategies to gain attention include storytelling, humor, active participation, questioning, examples, analogies, etc. The second major motivational condition is that of 'relevance'. Pupils learn more, if they think that the topic is relevant to their personal needs. In order to make instructions relevant and provide opportunity for choice and responsibility, the individual should be able to assess the future usefulness and today's worth of learning. The next motivational strategy is building 'confidence'. This is to help learners to succeed, and therefore instruction should be provided in incremental complexity. Objectives should be clearly expressed and feedback provided to support success and develop learner confidence. The fourth motivational aspect is 'satisfaction', and instructional strategy would be to provide learners with opportunities to use the newly acquired knowledge or skill in the real world. Use of feedback and reinforcement increases intrinsic satisfaction with instruction. Other strategies should include formative evaluation and creating non-threatening learning environment.

We can state that every theory advocates using authentic, challenging tasks that require you to think and act with information as the basis of instruction. These theories give an emerging picture of the new paradigm of instruction. The diversity of theories of ID allows an instructional designer to select the tasks that best addresses the needs of specific instructional situation appropriate for distance learners.

Figure 2: Keller's Motivational Design of Instruction.

2.2.8 Dick and Carey Model

The Dick and Carey (1978) model is the most widely used and cited model in instructional design. This popular model is now in its fifth edition. As depicted in Figure 3, the first step is to assess needs to identify goal(s). Identification of instructional goals as a means to decide what the teacher/ designer is trying to achieve before the beginning of the instructional design process is very important in this model.

The next two steps are parallel: Conduct instructional analysis and analyze learners and contexts. The former determines the skills involved in reaching a goal and identify the tasks to be performed (procedural analysis) and mental operations used by a person. The latter determines the prospective learner's knowledge, skills, personality and the environment. The next step is to write performance objectives in specific measurable and achievable terms. This is followed by development of appropriate instruments for assessment of the objectives. The criterion-referenced tests items generated for each of the objectives help to diagnose an individual's acquisition of learning during the process of a lesson and are useful in formative and summative evaluation of the instructional systems itself.

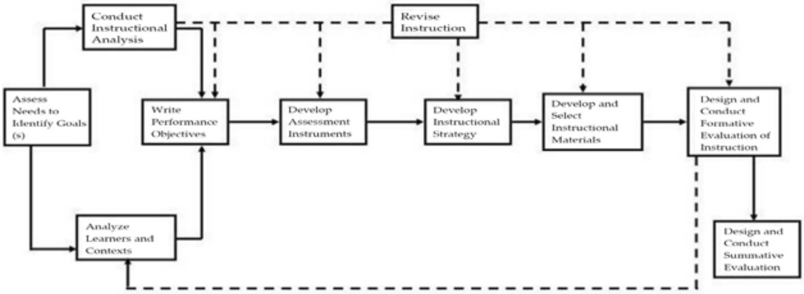


Figure 3: Dick and Carey Model (2001).

The next step, named develop instructional strategy is to select instructional methods (teacher-led, cooperative learning, demonstrations, discussion, etc.) to match the objectives. The next step – develop and select instructional materials emphasize appropriate choice of printed and/ or other materials to support instruction. This step also recommends identification and use of already existing materials, and development of new ones whenever required.

The next step is to design and conduct formative evaluation of instruction to provide data for revision and improvement of instructional materials and the overall process of instruction. The authors recommend a variety of methods including interview and small group discussion for the purpose of formative evaluation. The 'revise instruction' step in the model is actually a supplement to the formative evaluation stage and continuously collects data during the tryout process to facilitate decision making and revision. The last step in the model is the design and conduct of summative evaluation that checks the effectiveness of the system as a whole and is holistic in nature. This is mostly conducted at the end after a long gap of time.

2.2.9 Bergman and Moore Model

Bergman and Moore (1990) proposed the development model for the production of interactive multimedia (see Fig. 4 below). It is a systematic process that includes six major activities: analysis, design, develop, produce, author and validate. The output of each activity in the system becomes the input of the other, and thus is a linear model, but is represented in rows and columns. Each of the six activities can be considered as stages, and each stage has some input, activity, deliverables and evaluation. The design activities take into account issues related to sequencing of content, objectives, detailing out the message design and their treatment. This essentially is a 'blueprint' and also includes all media, interaction and navigation strategies, assessment methodology, etc. In the 'develop' stage, the application design is converted into specific strategies/ approaches that can be productive. The develop stage will deliver multiple documents as storyboards, audio scripts, short lists, etc. In the 'production' stage multiple media elements are actually produced, and in the 'author' stage these are integrated into one. The sub-activities in the author stage include coding, testing, and running. The 'validation' stage consists of comparing the finished product with that of the original objectives and undertaking necessary revision.

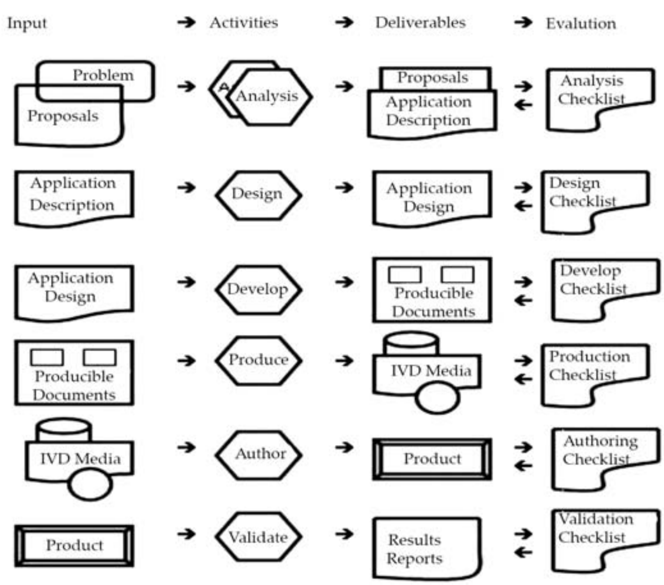


Figure 4: Bergman and Moore Model.

2.2.10 Smith and Ragan Model

Smith and Ragan (1999, 2005) model is one of the most recent instructional design models. It has three phases: analysis, strategy and evaluation. These three phases include eight steps which are: analyzing learning contexts, analyzing learners, analyzing learning tasks, writing tests items, determining instructional strategies, writing and producing instruction, conducting formative evaluation and revising instruction (Fig. 5).

The process is linear in nature from phase 1 to 3, but tasks inside the phase may be concurrent as well. Analysis of context involves ascertaining the need for instruction in a specific content and description of the environment where the instructional product will be used.

In the analysis phase, the characteristics of the learners are analyzed and learning tasks are broken down into appropriate instructional goals and objectives.

At this stage, test items are also prepared to measure the achievement of the objectives of the instruction. In the second phase, instructional strategies are identified and implemented that includes how to deliver the instruction and what methods and techniques to be followed.

Based on the strategies developed, instruction is produced and implemented. In the evaluation phase formative evaluation is conducted, the results of which are ploughed back into the systems for revision of instruction.

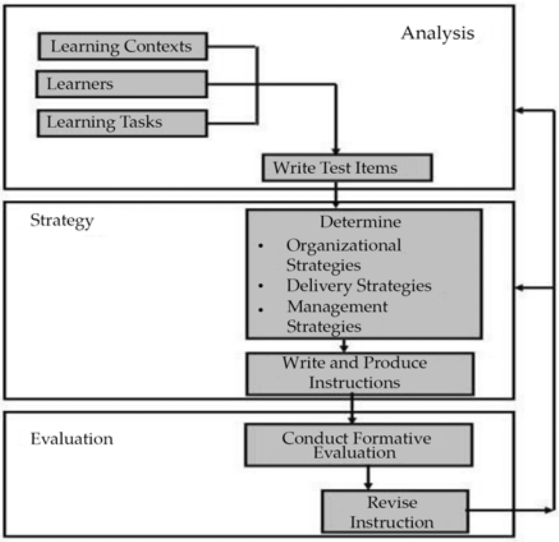


Figure 5: Smith and Ragan Model.

2.2.11 ASSURE Model

This model of instructional design that is represented by the acronym ASSURE, which stands for Analyse, State, Select, Utilize, Require, Evaluate (Fig: 6).

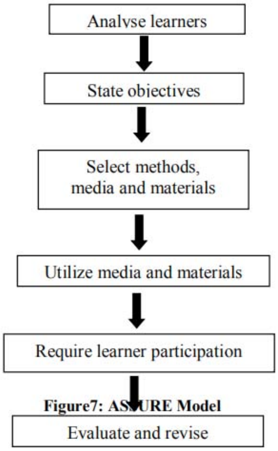


Figure 6: ASSURE Model.

The ASSURE model is similar to the Gagne's nine steps of instruction. It is a procedural guide for planning and conducting instruction in a classroom that uses media. The first step in this model is to analyze the learners and understand their general characteristics, their entry competencies (knowledge, skills and attitudes), and learning styles. The next step is to state the objectives in measurable terms. The objectives should be stated in terms of what the learners will be able to do as a result of instruction. According to this model, a well stated objective meets four criteria, called ABCD, where A is Audience for whom the objective is intended, B is Behavior to be demonstrated, C is Condition under which the behavior will be observed, and D is Degree to which the new skill must be mastered. Once the objectives are identified and stated, the next step is to select methods, media and materials to deliver the necessary content that will help achievement of the objectives. In a way, this stage is the bridge between content and objectives. In this stage, based on the need, new materials are also prepared.

The next stage is the actual stage of implementation, where the media and materials selected are utilized in the classroom situation. Before the actual utilization, it is important that the materials are previewed and the classroom is prepared for utilization. It is in this stage, that the instructor can include some of the instructional events of Gagne. The next step is actually a concurrent activity of the previous step. In order to make the instruction useful and effective, the learners, participation is required. Instructor's use of media and materials is not sufficient alone; the learners should participate/ engage in the learning process. Thus, there should be activities within the lesson to encourage participation. The instructor should provide necessary feedback on the efforts put in by the learners before formally evaluating it. The last stage in this model is to evaluate and revise. This includes both assessment of the learner achievement as well as the evaluation of the whole process of instruction. The result of both helps us to revise the instructional process.

2.2.12 Constructivist Instructional Design Models

Most instructional design models discussed so far are based on learning theories from the behavioral and information processing involving well-structured procedures the major focus was in learning environment reinforcement and situated learning. However, there is a growing body of literature on instructional design from the constructivist perspectives. Herrington and Oliver (2000) have identified nine elements to design constructivist instructional design. These are:

1. Provide authentic contexts that reflect the way the knowledge will be used in real life.
2. Provide authentic activities.
3. Provide access to expert performances and the modeling of processes.
4. Provide multiple roles and perspectives.
5. Support collaborative construction of knowledge.
6. Promote reflection to enable abstraction to be formed.
7. Promote articulation to enable tacit knowledge to be made explicit.
8. Provide coaching and scaffolding by the teacher at critical times.
9. Provide for authentic assessment for learning within the tasks.

There are few instructional design models in the constructivist paradigm. For example, The Recursive and Reflective Design and Development (R2D2). The R2D2 model is based on three generic guidelines of constructive paradigm – Recursion, Reflection and Participation. Instead of being prescriptive, the model is suggestive and unlike other instructional design model, it is non-linear in nature.

The model believes that the objectives, the context, the teaching and learning strategies emerge during the course of the design process rather than being specified precisely early in the process. The design process is iterative. Each issue is addressed again and again in the design and development process in the specific context. The designer also uses the reflective practice – reflection-in-action and reflection-on-action of Schon. Thinking about our work and what we are doing leads us to reformulate the problem/ tasks in hand. Participation guidelines of the model are little difficult to implement, as it believes that the learners should be involved in the design process. But, participatory design is highly significant and useful for specialized training in technical and behavioral aspects. It improves learning due to ownership of the design by the participants.

The constructivist approach fosters the learner's construction of knowledge and can be applied in varying degrees to any of the models discussed earlier, which entails selecting relevant information, organizing it and integrating it with existing knowledge. This model focuses on ways to develop instructional materials for print/text or multimedia to support distance learners. It is up to the instructional designer to accommodate the best of different approaches and models in his/her own practice.

An instructional designer has to carry out different roles while designing learning for distance learners. They are:

- Designing a blueprint of a programme/course;
- Discuss the models and theories (ADDIE) with distance learners, academics, subject expects and media specialists;
- Creating an architecture for arrangement of content with the instructional framework.
- Creating a design to present information/content to the distance learners with interactive and access devices based on learning outcomes.
- Designing multimedia and selection of media components;
- Demonstrating the procedures of navigating LMs platform;
- Creating open courseware content.

The theories and instructional design models helps an instructional designer to create instructional events while preparing self-learning materials for distance learners, who have different learning experiences, learning styles and preferences. Therefore, an instructional designer has to play the role of joint venture with the subject specialists, as well as surrogate distance learners and innovator.

2.2.13 Cybernetic Psychology

The term Cybernetic has been coined from the Greek word Kubernetes meaning steer man. The function of steer man is to steer the ship or boat in a right way in a right direction. This means that the person should have proper control over the steering function. In the similar way, the teacher is the steersman of the teaching-learning process. He has to take along with him the pupils for reaching a set goal by steering out a learning path. For this purpose, the instructional system he chooses must be appropriately controlled. While working with system, if he gets feedback that the system is working properly in terms of output, it will be steered with no change. But if he gets communication that there is something wrong with the system, he will try to set it right. For this purpose, he may have to bring changes in his own method of teaching, the size of quality of the content or learning experiences, interaction with his students, etc. and again the system is put to work after being corrected.

Cybernetic Theory

Cybernetic theory views an individual as a feedback system which generates its activities in order to detect and control specific stimulus characteristics of the environment. It analyses intrinsic mechanism by which control is established and sensory feedback mechanism maintained. The focus of the whole theory is the dynamic feedback and self regulation. All systems include at least three basic elements; input, process and output

1. The input unit; It provides some process by which material or information's entered the system

2. The process unit; It acts on the material of information to modify it in any way.
3. The output unit; It consists of some technique for discharging the results of process from the system. The output is called feedback.

The Cybernetic Model of Education

It is possible to present the model of the educational system using a control system where the real system is the learner himself, in fact his knowledge system. The process which we manage is student's learning, that means building of the knowledge system of the learner who is supposed to achieve standards in each of the parameters or the prescribed level of the profile of the graduate. The motivation, the work of the teacher, the acquisition and processing of information (a process of learning) changes the real object. The ideal system which is compared to the real system is expressed by the standards. In case that the learner does not reach the prescribed level of knowledge, based on the difference in knowledge, it is necessary to apply the feedback regulator represented by the teacher, by the influence of the environment and the surroundings, by acquiring new knowledge from different sources, that means learner's process of learning. The feedback regulator does not respond to the positive difference, the situation when the learner knows more than it is prescribed by the standards.

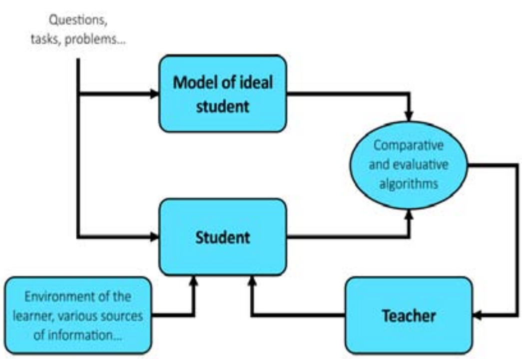


Figure 7: Cybernetic model of school education.

Application of Cybernetics to Education

1. It enables the teacher to understand some of the fundamental mechanisms which control learning.
2. The principles of cybernetics are applied for classroom instruction for group as well as individual learning
3. It provides the basis for self-education. The feedback control is used to develop programmed instructional material.
4. Cybernetic principles are used for developing remedial instruction or individualized instructional material
5. Teacher education programme can be improved by employing innovative practices like micro-teaching, stimulated social skill teaching and interaction analysis which are based on the theory of feedback.

Advantages

The following are the major implications of Cybernetic in education;

1. It is applied in group as well as individual classroom instruction
2. It enables the teacher to understand some of the fundamental mechanism that control learning.
3. It provides the basis for self education. The feedback control is used to develop programmed instructional material.
4. Its principles are used in developing remedial instruction or individualized instructional material.
5. Teacher-education programme can be improved by employing the mechanism of feedback devices for the modification of teacher behavior
6. The innovative practices in education programme such as micro teaching, stimulated social skill teaching and interactional analysis are based on the theory of feedback

7. The input, process and output units of teaching enable the teacher to understand and analyze teaching in more scientific manner
8. Teaching activities can be made highly structured and well organized in view of learning objectives.

2.3 BLOOM'S TAXONOMY

Bloom's Taxonomy is a classification system developed in 1956 by education psychologist Benjamin Bloom to categorize intellectual skills and behavior important to learning. Bloom identified six cognitive levels: knowledge, comprehension, application, analysis, synthesis, and evaluation, with sophistication growing from basic knowledge-recall skills to the highest level, evaluation.

The Three Domains of Learning

The committee identified three domains of educational activities or learning:

- *Cognitive*: mental skills (*knowledge*)
- *Affective*: growth in feelings or emotional areas (*attitude or self*)
- *Psychomotor*: manual or physical skills (*skills*)

Since the work was produced by higher education, the words tend to be a little bigger than we normally use. Domains may be thought of as categories. Instructional designers, trainers, and educators often refer to these three categories as KSA (Knowledge [cognitive], Skills [psychomotor], and Attitudes [affective]). This taxonomy of learning behaviors may be thought of as "the goals of the learning process." That is, after a learning episode, the learner should have acquired a new skill, knowledge, and/or attitude.

While the committee produced an elaborate compilation for the cognitive and affective domains, they omitted the psychomotor domain. Their explanation for this oversight was that they have little experience in teaching manual skills within the college level. However, there have been at least three psychomotor models created by other researchers.

Their compilation divides the three domains into subdivisions, starting from the simplest cognitive process or behavior to the most complex. The divisions outlined are not absolutes and there are other systems or hierarchies that have been devised, such as the Structure of Observed Learning Outcome (SOLO). However, Bloom's taxonomy is easily understood and is probably the most widely applied one in use today.

2.3.1 History of Bloom's Taxonomy

Bloom's Taxonomy was created in 1948 by psychologist Benjamin Bloom and several colleagues. Originally developed as a method of classifying educational goals for student performance evaluation, Bloom's Taxonomy has been revised over the years and is still utilized in education today. The original intent in creating the taxonomy was to focus on three major domains of learning: cognitive, affective, and psychomotor. The cognitive domain covered "the recall or recognition of knowledge and the development of intellectual abilities and skills"; the affective domain covered "changes in interest, attitudes, and values, and the development of appreciations and adequate adjustment";

and the psychomotor domain encompassed "the manipulative or motor-skill area." Despite the creators' intent to address all three domains, Bloom's Taxonomy applies only to acquiring knowledge in the cognitive domain, which involves intellectual skill development.

In the 1990s, one of Bloom's students, Lorin Anderson, revised the original taxonomy. In the amended version of Bloom's Taxonomy, the names of the major cognitive process categories were changed to indicate action because thinking implies active engagements. Instead of listing knowledge as a part of the taxonomy, the category is divided into different types of knowledge: factual, conceptual, procedural, and metacognitive. This newer taxonomy also moves the evaluation stage down a level and the highest element becomes "creating."

2.3.2 Bloom's Taxonomy in the Classroom

Bloom's Taxonomy can be used across grade levels and content areas. By using Bloom's Taxonomy in the classroom, teachers can assess students on multiple learning outcomes that are aligned to local, state, and national standards and objectives. Within each level of the taxonomy, there are various tasks that move students through the thought process. This interactive activity demonstrates how all levels of Bloom's Taxonomy can be achieved with one image.

In order for teachers to develop lesson plans that integrate Bloom's Taxonomy, they write their lessons in the language that focuses on each level. The United States Geological Survey provides a list of verbs for each level of Bloom's Taxonomy for teachers to use when developing lesson plans. (Although the list is designed for environmental science teachers, the examples will work for any discipline.)

Cognitive Domain

The cognitive domain involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories of cognitive and processes, starting from the simplest to the most complex:

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

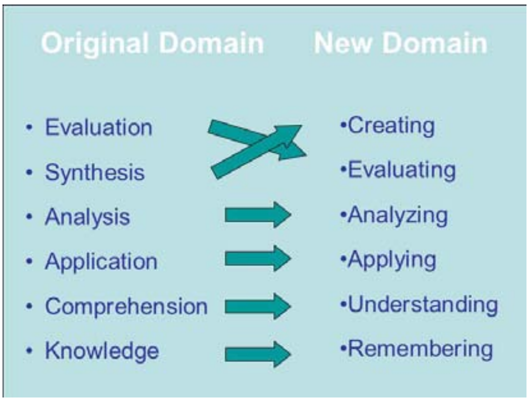
The categories can be thought of as degrees of difficulties. That is, the first ones must normally be mastered before the next one can take place.

2.3.3 Bloom's Revised Taxonomy

Lorin Anderson, a former student of Bloom, and David Krathwohl revisited the cognitive domain in the mid-nineties and made some changes, with perhaps the three most prominent ones being:

- changing the names in the six categories from noun to verb forms
- rearranging them as shown in the chart below
- creating a processes and levels of knowledge matrix

The chart shown below compares the original taxonomy with the revised one:



This new taxonomy reflects a more active form of thinking and is perhaps more accurate. The new version of Bloom's Taxonomy, with examples and keywords is shown below.

Table 1: Table of the Revised Cognitive Domain

Category	Examples, key words (verbs), and technologies for learning (activities)
Remembering: Recall or retrieve previous learned information.	Examples: Recite a policy. Quote prices from memory to a customer. Recite the safety rules. Key Words: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states Technologies: book marking, flash cards, rote learning based on repetition, reading

Understanding: Comprehending the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.	Examples: Rewrite the principles of test writing. Explain in one's own words the steps for performing a complex task. Translate an equation into a computer spreadsheet. Key Words: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates Technologies: create an analogy, participating in cooperative learning, taking notes, storytelling, Internet search
Applying: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the work place.	Examples: Use a manual to calculate an employee's vacation time. Apply laws of statistics to evaluate the reliability of a written test. Key Words: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses Technologies: collaborative learning, create a process, blog, practice
Analyzing: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.	Examples: Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training. Key Words: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates Technologies: Fishbowls, debating, questioning what happened, run a test

Evaluating: Make judgments about the value of ideas or materials.	Examples: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget. Key Words: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports Technologies: survey, blogging
Creating: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.	Examples: Write a company operations or process manual. Design a machine to perform a specific task. Integrates training from several sources to solve a problem. Revises and process to improve the outcome. Key Words: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes Technologies: Create a new model, write an essay, network with others

Cognitive Processes and Levels of Knowledge Matrix

Bloom's Revised Taxonomy not only improved the usability of it by using action words, but added a cognitive and knowledge matrix.

While Bloom's original cognitive taxonomy did mention three levels of knowledge or products that could be processed, they were not discussed very much and remained one-dimensional:

- *Factual* - The basic elements students must know to be acquainted with a discipline or solve problems.
- *Conceptual* – The interrelationships among the basic elements within a larger structure that enable them to function together.

- *Procedural* - How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.

In Krathwohl and Anderson's revised version, the authors combine the cognitive processes with the above three levels of knowledge to form a matrix. In addition, they added another level of knowledge - metacognition:

- *Metacognitive* – Knowledge of cognition in general, as well as awareness and knowledge of one's own cognition.

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CHAPTER 3

COMMUNICATION & INTERACTION

INTRODUCTION

Communication is the key to understanding. Having effective communication skills helps resolve conflicts—and can prevent them from occurring. Paraprofessionals must communicate effectively with students, teachers, parents and others. There are many ways to actively improve your ability to engage in communication, in both written and verbal form. Good communicators are assertive, attentive listeners, able to articulate their message, and tactful. They also display a positive attitude, communicate negative feelings effectively, and use appropriate nonverbal signals.

Communication is sharing our feelings, ideas and opinions with others. This can be intellectual, personal, spoken or written in nature. We live in groups and man is invariably a social animal. As the social needs insist that we share our thoughts with others. This can be called communication. It is a two-way process. Communication motivates, informs, suggests, warns, orders, changes behaviour, and establishes better relationships, to make interaction meaningful and make oneself understood. Communication is effective when a communicator is effective enough to communicate competently, simply, clearly, sincerely and dynamically. Ones communication can be termed as successful, if the receiver acknowledges it, i.e., when a listener or reader understands, reacts, responds to this communication and shapes his/her learning behaviour. The word communication is derived from the Latin word 'communis', which means 'common', i.e., to share, exchange, send, transmit, write, relate and communicate. The other etymological source mentions that 'communication' is derived from the Latin term 'communicare', which means to impart or participate. This word often denotes and means different things to different people. In short, we can define communication as sharing ideas and feelings mutually. As it involves interaction, it encourages exchange of ideas until all the experiences become a common profession.

Communication is essential for close, sympathetic relationships in the society and for transformation of men, material and thoughts from one place to another. In a classroom, the meaning of communication is related to the messages and counter-messages, which constitute the teaching-learning process. This involves initiation, reception and response that serve as feedback.

3.1 COMMUNICATIONS IN THE FORMAL EDUCATION SECTOR

Education systems tend to work on three inter-connected levels: a) the macro level – where national policies are developed and negotiated; b) the meso level – which oversees the implementation of national policy into practice, this is often located in the equivalent of provincial/local departments of education; c) the micro level: the schools and communities where policies are put into practice, and where educational stakeholders want to see change in practices in education. Effective communications in formal education systems therefore have to take place at a range of levels and include diverse groups of actors, depending on the messages and ideas being communicated. Civil society organizations often interact at all levels of educational systems, building support at the grassroots level and advocating for change at the governmental level.

In most education systems policy making takes place at the national level, and it is here that most education systems take their lead. The majority of knowledge outputs from research, development and advocacy programmes are directed to this level; and interactions with donors and the international education community mostly happen at this level. Communications in this respect are multi-layered and multi-directional. There is communication around the policy making processes themselves: why and how certain policies are pursued; how different stakeholders are involved in the process; the role of research and development advocacy in these processes.

In most countries there are also provincial/local educational authorities, whose responsibilities and communication roles vary according to country context. There has been a growing trend in recent years to decentralize some of the activities from central government to these provincial authorities. Decentralisation is seen as a pathway for improved delivery of social services and a mechanism to improve the democratization of decision-making for increased system efficiency (see Dunne et al, 2007 for a recent review). However, criticisms of how this has worked in practice in some contexts question the degree to which power is actually transferred to provincial authorities, and the extent to which education planning actually remains centralized and highlight possibilities of manipulation by elite groups. There are a range of potential communication roles and activities at the provincial level. In many countries provincial level educational authorities act as a conduit through which national policy traverses - they are expected to ensure implementation takes place at the school level and perform monitoring functions on school level performance. There is also a sense that communities and schools can work better with local educational authorities (rather than national), as lines of communication should be more immediate and aims more localized.

While conventionally much of the communications between the school/community level and national and provincial authorities has been top down (e.g. policy interventions communicated to and implemented at the school levels), increasingly the need for bottom up communications has been recognized. Moreover, as responsibilities in education management seemingly shift towards the school and community level, this requires capacity development for communications, as well as spaces and opportunities for communicating. The democratization of educational structures seeks to enhance ownership of education at community levels, but also shifts some of the responsibility around policy implementation away from national and provincial authorities. Communication within schools and between communities and schools is also seen as key. A main function of schools is to provide learners with a range of skills, knowledge and competencies, which have their basis in some sort of interaction: e.g. teacher-student; student-student; student learning resource. There has also been an increased focus on community school interactions, and the potential benefits this type of communication might bring.

3.1.1 Importance of Communications in Education

A range of arguments can be put forward for the importance of integrating communications within education systems. Some of these are highlighted below and explored through the text. It can be claimed that good information and effective communications might help:

- enable communities and civil society to engage with educational issues at the school level, raise issues with educational providers and promote accountability of provision and promote public engagement with educational reform programmes
- increase public awareness of educational rights and make the uptake of educational services more likely, both for children and adults
- provide evidence to support decision-making processes
- improve the quality of policy formulation
- build shared understandings which may lead to social change

- improve educational service delivery and policy implementation
- involve the voices of the marginalized groups, to make educational provision relevant to their needs
- empower people to make decisions and develop ownership of educational processes
- improve the quality of learning and educational outcomes

Having said this, the role that communications might play could be influenced by education levels. For example, in situations where people have little or no literacy, certain approaches to communications could be seen as exclusionary (i.e. those which are written). Thus, by using certain forms of media, certain population groups are more likely to be marginalized from getting information and being involved in decision-making. These communicatory exclusions are less likely to be experienced by literates who have access to a range of information sources. Other forms of communication media (i.e. radio) are viewed as more inclusionary, especially if efforts have been made to ensure broadcast material is designed to communicate effectively with a range of target audiences.

There is some general literature on communications which provides guidance on good practice. These tend to be focused on a particular communications relationship e.g. the link between researchers and policy makers; civil society advocacy; communications for development projects; and participation in policy making.

There has been less focus on looking at the range of communications relationships from a sector wide perspective, and specifically the education sector. Even so, the general literature does offer a range of insights that will inform this paper. These include: 1) the need to create spaces for communications, to ensure a range of voices are heard and service provision is relevant to the full range of users; 2) communications needs to be embedded within institutional structures and systems, as well as project and programme designs; 3) research should be disseminated in a form that suits target audience needs; 4) access to information can increase user-engagement with issues; 5) communication capacity can be developed throughout the educational sector; and 6) communications initiatives take time and money.

3.1.2 Limitations

There are a number of limitations to this report which will be highlighted in brief. Firstly, education is an immense field, with forms of communications present throughout. This report cannot attempt to account for the vast range of communication activities in their context-specific locations. Rather it attempts to provide a snapshot of these, and seeks to identify some of the impacts they have had. Secondly, while communication activities take place constantly in education, they are rarely documented and, where they are, the documentation is often based on self-reporting of the agencies involved in such activities.

There is a dearth of material which looks specifically at communication practices (ICDs) in education, and in particular the impact of these (although this paper attempts to draw on the examples and case studies which do exist). Although, more information appears to be available in certain areas: health education, environmental education and ICTs in education, this is not necessarily indicative of the importance they command in the sector as a whole.

Similarly, some countries have more available information on communication practices, and possibly more developed communication strategies (South Africa is a good example of this), whereas others offer less evidence of this. Thirdly, as this was a document-based review, it is restricted to those materials which were easily available via search engines and/or known to the author or contacts made during the report writing. The review has also been restricted by language, to materials available in English. Finally, this report is literature-based and is dependent on the methodological validity of the studies, documents and resources used.

3.2 DISCUSSION AND EVIDENCE OF COMMUNICATION THEMES

There are four communication themes will be discussed in more detail, a brief review of literature will be given and examples provided. The first subsection will look at communications with policy makers in education.

3.2.1 Communications with Policy Makers in Education

Communication with policy makers is multi-faceted, multi-directional and takes place between different stakeholders at different times. This field is particularly important in the education sector because of the way education systems are set up. Most education systems are controlled centrally, with varying degrees of power held in provincial departments of education. National (and provincial, depending on the system) governments shape and direct the education system in a number of ways, for example formulating the curricula; setting assessment procedures; and establishing budgets. Policymakers therefore have substantial decision-making power and are key conduits for communications, both demand and supply-driven.

One important area of communications with policy makers relates to the knowledge arena. The complexities of communications in three ways: supply-side, demand-side, and policy currents, and outlines some of the weaknesses in communicating knowledge and information. In terms of the demand-side policy makers often want relevant, good quality information, but this can be in short supply, or communicated poorly. For policymakers to 'pull-in' this information, she describes how there might be both systemic and individual limitations. These might include a lack of knowledge of the types of information available; anti-intellectualism from some policy makers; the pressures on policy makers working to immediate time frames; and the selective use of information to reinforce policy preferences, prejudices and political choices. Supply-side information often comes from researchers, consultants or advocacy groups hoping to communicate with and influence policy makers. In terms of communicating to policy makers, advice for researchers includes: developing relationships with target audience members; understanding the policy environment; and providing relevant information, suitable to target audience needs, making it accessible and timely.

Now looks at different forms of communication with policy makers: consultation processes; public participation; global campaigns and research policy linkages from the perspective of the education sector.

Information Gathering: Communications for Consultation

Consultations are used by policymakers to generate and collect information from a range of stakeholders. Consultation is used to gather the ideas and opinions of a group through, for example, focus groups, workshop participation, online/email discussions, interviews and questionnaires. Research identifies some potential weaknesses in information gathering for consultations. A typology of participation, describes how consultative processes do not concede any share in decision making, with external agents under no obligation to take on board people's views. There are also often questions about representivity, whose voices are heard, and who gets excluded from consultation processes, and often in education it is those who are most marginalized. The focus and boundaries for consultations are usually set by the group seeking information, meaning the respondents are controlled to some extent. Whilst consultations open up spaces for dialogue, the impact these voices have varies. In some cases consultation processes have been used to legitimize policy decisions already made or develop notions of ownership around policy. In others, it has been an open and independent process, with outcomes that have impacted on policy and policy makers.

Some examples of consultations in education are given below, including ones involving children and community members as stakeholders.

Children's participation in PRSP processes: Vietnam and Honduras

The following example is taken from work carried out by Save the Children in Honduras and Vietnam in particular. While the focus of the intervention was not on education directly, it appears to have had an important indirect impact on raising the profile of education within Poverty Reduction Strategy Papers (PRSPs) in these countries. PRSPs, which aim to provide approaches to promote growth and reduce poverty in countries, expect civil society to be consulted in their formulation, with the intention of presenting opportunities for civil society to influence government strategy and policy.

The reality of consultation processes in PRSPs has varied, often with limited involvement of many education stakeholders in practice. Adopting an innovative rights-based approach to child voice, Save the Children created spaces to consult with children, gathering their views and experiences which Save the Children then used (as a civil society body) to advocate around these issues during the PRSP formulation. The consultation processes used with children, as "challenges which require considerable resources – facilitating and resourcing children and young people's groups, producing accessible versions of key documents and finding ways that children and young people's input can be communicated to adults". She also warns against the 'tokenistic' participation of children and the dangers of co-option.

In both countries, child respondents raised concerns around their access to education and identified weaknesses in the quality of education services provided.

As a consequence to these inputs the profile of child poverty and education was raised in the PRSPs in both countries. In Vietnam, changes were made to procedures relating to unregistered migrants and the completed PRSP included many more references to children than it had in its planning stages. In Honduras government officials prioritised the issue of child poverty, including targets to reduce child labour and committed funds to fund education initiatives for child workers. It seems that, by including children in PRSP processes in such contexts, there was a knock-on effect for children and education.

Raises a number of issues with respect to including children in these processes. There was concern about who was involved and whose voices were heard, with the inclusion of poor, marginalised groups seen as particularly important. There was a question around the amount of time and the financial implications of gathering this type of information. There were also issues around what happened to the views of children once they were collected, how they were communicated within the PRSP process and who made decisions about what was included or not. Added to this, it is important to see how the PRSP is subsequently linked to education policy structures. With these points in mind, this appears a good example of creating space for eliciting and communicating the context-specific views of children into policy processes, from which they are often excluded.

Multi-level participation in policy making processes: the Review of Curriculum 2005 in South Africa

The review of Curriculum 2005 in South Africa is an example of how policy-making processes can be opened up to a whole range of actors, the communication processes this involved, and the impact this had. Curriculum 2005 was established in 1997 and a review called for after the Minister of Education Kader Asmal's 'listening campaign' of 1999. The process which is described below, started at the beginning of 2000, with the Revised National Curriculum Statement being produced in 2002.

The experience from South Africa is particularly interesting with respect to the extent to which government encouraged a multiplicity of voices within the review process, the communication devices used and how these were acknowledged in the revised document. This focus on participation (and communications) in policy making comes in part from the constitutional focus on democracy, but also reflects a deep-seated belief that education can help transform South African society from the inequalities of the past. Communications were integral to the processes of policy reform. At each stage key stakeholders and members of the public were consulted and their views sought. The impact of the process was also impressive leading to an overhaul of curriculum structures.

The communication processes involved in the revision of the post-Apartheid South African curriculum were quite unique. There were a number of factors at play including supportive political leadership and timing of the reform. The Minister of Education displayed the desire to be seen to be as inclusive as possible. According to Chisholm the Government used participation as a means to create ownership and legitimation of the changes - the communication practices helped build a critical mass and validate the outcomes. The point that channels for debate of this sort had to be re-opened as in the immediate aftermath of apartheid they had been closed off, and only when "a renewed tolerance of critique" was enabled could the debates around C2005 take place.

E-consultations

There are some examples of online e-consultations in education, two of which are referred to here. In e-consultations stakeholders are specifically being consulted on an issue, with information gathered up and used by the consulting body as they decide.

The Department for Children, Schools and Families (DCSF) for England and Wales has pages on its website dedicated to e-consultations The aim is to "open up decision making to as wide an audience as possible, making consultations more valuable" (DCSF website). Members of the public are able to view and respond to e-consultations and are allowed at least three months to make comments. The DCSF are obliged as part of their guidelines to "give feedback regarding the responses received and how the consultation process influenced the policy", but are under no obligation to take on the points.

E-consultation on literacy for 2006 EFA Global Monitoring Report (GMR): For three weeks in March 2005, the GMR held its first electronic consultation to "capture a broad range of voices and concerns" on literacy, the theme of its 2006 edition. It put a full draft of the GMR online for public comment and invited responses on any aspect of the report outline. There were also moderated online consultations on aspects of literacy. The consultation was addressed to individuals and organisations with experience in the field of literacy and education for all. Around 1500 individuals were invited to participate and they were asked to inform colleagues. There were 114 registered members, with 164 postings and 3,715 readers. The consultation was moderated by an expert in the field and an advisor to the 2006 GMR. At the end of each week, the moderator provided a summary of discussion and invited participants to further develop certain key themes. The GMR provided a summary document of the issues raised through the consultation process. It described how the online consultation had informed debates in the preparation of the GMR (the areas highlighted included conceptualisations of literacy, strategies to develop literacy and policies). Given the scope of this report, it is difficult to assess the extent to which these consultations actually impacted on the final GMR and other influencing factors which might have been involved. This would require further study.

Holding the education sector to account: public participation processes

Some of the public participation processes which are aimed at increasing accountability of the education sector are reviewed. Much of this is based on the work of civil society organisations and NGOs and a range of communication methods, which will be discussed. There is less (reported) evidence of individuals and communities on their own using these mechanisms to hold the education sector to account. Dissemination of information and knowledge building seem to be key to these processes. Indications of impact of these initiatives are often self-reported and sometimes anecdotal.

3.3 THEORIES OF CLASSROOM COMMUNICATION

Whatever age we are, we go to school to learn. And no matter the type of student, learning depends on good communication. Take a moment to think about your experiences as a student in the classroom. Did you ever struggle to understand or communicate with the instructor? What were some of the barriers in communication? Perhaps the teacher was very strict and that made you fear punishment. Or maybe the environment in the classroom was too competitive and that made it hard for you to ask questions.

3.3.1 Communication Theories

After having studied the meaning, the process, and the techniques of communication, it is reasonable to examine various theories of communication which are directly or indirectly related to education . As mentioned earlier education is a process of communication and to understand this process for its further development it is necessary to study the relevant theories of communication. We do not intend to propagate those theories nor shall we explain them from the viewpoint of the discipline of communication. Rather we shall touch upon such aspects of these theories as have relevance to educational practices. What follows is a brief description of four theories - two of which are directly related to education (viz. mathematical theory, and information theory), and two of which have only an indirect bearing on education (viz. free press theory and social responsibility theory). Besides, we shall discuss their educational implications.

3.3.2 Mathematical Theory

The early theoretical bases of communication owe much to the views held by Shannon and Weaver (1949) known as the mathematical theory of communication, their views are based on developments in electrical systems and electronics. For them, the main channels of communication were telephone cables and radio waves. The communication process is divided into components like the source, the transmitter, the signal and the receiver. The channel is the medium that sends information from the sender to the destination by means of signals. For example, in a conversation the sender's brain is the source; the voice mechanism produces signals through spoken words and transmits it through air (the channel) and the receiver decodes the message from the signals.

Though originally applied to the fields of engineering and mathematics, this theory has been widely applied to the broader field of human communication. This mathematical theory of communication has greatly influenced present day educational thought and practice. We may examine a few of its educational implications as follows.

3.3.3 Educational Implications in Classroom

In the processes of teaching and learning, information is passed on from the teacher to the learners. Usually one teacher may communicate with 50-60 learners at a time. In larger classes she may communicate with 100 learners. Thus the number of people involved in a particular situation of educational communication could not be more than 101 persons. The mathematical theory of communication helped-in enlarging this number, as it helped in improving the electronic media through which information could be distributed to large populations and so the monopoly of a few in relation to educational transactions was successfully overcome. With the help of developed communication technologies, information became more widely used and effective. Besides print material, other mass communication technologies like radio and television broadcasting came to be used for quick transmission to the audience learners. Moreover, video and computer technologies have questioned the role of the teacher as the sole authority in the teaching-learning process. Now, satellite technology has considerably overhauled and improved the process of instructional technology.

3.3.4 Information Theory

The mathematical theory gave birth to the information theory of communication which views communication as the procedure through which one mind affects another mind or, to put it differently, the procedure for conveying a message meaningfully to the person for whom it is meant. It is a theory of transmitting signals, viz., written language, spoken words, body movements, etc. At the source one message is selected out of the many available ones in any of the available forms to be transmitted to the receiver. Provision is also made for feedback in many forms that flows from the destination back to the source, helping the communicator correct the subsequent output.

The term 'message ' or 'information ' is not confined to news or facts, or to whatever is taught in the classroom, but also covers any content that reduces the uncertainty and disorganization of a situation. It may even include opinion, emotion, motivation or persuasion. It even goes beyond words to include silent gestures which are called 'forms'.

This theory emphasizes communication networks in which data are organized, ordered and related and such similarities and connections are shown as had previously not been perceived. Physical tests can be applied to verify predictions. This theory is heuristic, for it has led to new and previously unknown facts and methods.

Chute (1987) adapted the Shannon-Weaver model by adding examples of message transmission media. While retaining the basic form of the communication, Chute suggested that various media could potentially serve as the 'source' in a communication process. Chute's model is perceived as the initiator of interactive communication. Wagner (1994) stated that the models developed by Schramm and Chute can be used to help distance educators to conceptualize the mechanics of interactive telecommunication.

3.3.5 Educational Implications

The information theory of communication has greatly contributed to the process of teaching-learning in terms of the effect of the teacher (or even of print materials) on the minds of the learners, and the process of feedback being provided by the learners to the teachers to improve teaching, and also by the teachers to learners for effective learning. Feedback in the classroom can take many forms including negative ones such as puzzled looks or signs of boredom like yawning which inform the teacher that the point at issue needs further clarification or that it is time to move on to another topic, or perhaps to stop teaching for the moment. Similarly, feedback in the case of distance education should be used to improve upon all the subsystems - administrative, academic and industrial.

3.3.6 Free Press and Social Responsibility Theories

These theories indirectly influence the system of education in terms of the sociology of education. The free press theory originated from the libertarian theory of Siebert and others, which emphasized the freedom of printing press and its liberation from official control in the seventeenth century, and this is considered the main legitimizing principle for print media in liberal democracies. Simply, this theory says that an individual should be completely free to express himself, and should not be forced to suppress his/her feelings and emotions. She is free to give information to the press and to publish whatever she likes. This is one of the fundamental human rights.

People are free to express themselves as long as that expression does not harm others, and the press is a means of arriving at the truth. Control of the press leads to the hiding of facts. On the other hand, the press is to be made free to the extent that it does not go against the nation. It should be free ‘ from unreasonable censorship but must be answerable to law.

Educational systems are indirectly influenced by this theory, in the sense that it helps the system of education through free press to bring the reality close to the learners in a learning society, and to make them aware of their rights as well as responsibilities. The aim of education is to bring about the socio-economic and political development of the nation, and a free press accelerates this process.

The social responsibility theory originated from the 'Commission of Freedom of the Press' in the United States. This theory demanded that the media - print and broadcasting - have a social responsibility and must be answerable to society through various kinds of democratic procedures. It reconciles three divergent principles, viz.,

(i) Individual freedom and choice,
(ii) Media freedom, and
(iii) Media obligation to society.

Media is to be self-regulating within the legal framework of a nation along with its obligation to society, and it should avoid anything that might lead to violence or communal disturbances.

The contribution of this theory to education can be summed up thus:

Education tries to develop moral ideas and values among individuals, to provide more and correct information to them and to ensure progressive social development; and in this task the social responsibility theory of communication helps much in terms of media responsibility in transmitting correct information to all citizens who are learners and in the process of developing their moral values.

3.4 TYPES OF COMMUNICATION

Classroom communication exists in three categories: verbal, nonverbal and written. Verbal communication means anything that a teacher or student speaks aloud. Nonverbal communication refers to body language that people express. Written communication is writing directed at a specific audience, such as report card comments or student assignments. Teachers and students interact with one another in many different contexts, and use all three of these types of communication.

3.4.1 Teacher/Class Communication

Teacher/class communication exists when a teacher communicates with his entire class. Verbal communication exists when a teacher tells students information they need to know. For example, if a teacher asks a student to "stop talking," this is a direct form of verbal communication. There are ways for teachers to communicate nonverbally with their classes, such as through their posture, gesticulations and proximity to the students. Instead of telling a student to stop talking, a teacher could use nonverbal communication by moving toward the disruptive student's desk. Not only does the disruptive student receive the message, but other students in the class who observe the intervention receive it as well. Written instructions for an assignment are given from the teacher for the whole class.

3.4.2 Teacher/Student Communication

Teacher/student communication occurs when a teacher interacts directly with a particular student. Since a teacher interacts with her students mostly in front of the whole class, it can be difficult to distinguish teacher/student communication from teacher/class communication. Teacher/student communication requires that the teacher act one-on-one with a student, such as in a conference during class activities, before or after class or after school. This type of communication is effective for teachers who want to communicate a private message, such as a talk about constant inappropriate behavior or about taking more of a leadership role in class.

3.4.3 Student/Teacher Communication

Student/teacher communication is also direct communication between a student and the teacher, but this time it is the student who initiates the conversation. Also, this can occur during whole-class participation. For example, a student who asks a teacher a question during class discussion engages in student/teacher communication because it is a single student communicating with a single teacher. The reason the reverse situation constitutes teacher/class communication and not teacher/student is that the teacher's actions and messages are directed toward the whole class while the student's questions here are only directed at the teacher. When students write emails to their teacher on graded assignments, this constitutes a written form of student/teacher communication.

3.4.4 Student/Student Communication

Student/student communication occurs when two or more students interact with one another. Successful whole-class discussion stimulates student/student communication because students should talk to each other and not just to the teacher. Two students may disagree and talk back and forth to each other during such discussions. Student/student communication also occurs when students work in groups or pairs to complete assignments.

3.4.5 Student/Class Communication

Student/class communication exists when a student or group of students direct their messages to the entire class. Whole-class discussion can also stimulate this type of communication. For example, if a student asks the class a question during a discussion, the student's message is directed at the entire class. Individual or group presentations also constitute student/class communication, and it is this type of communication about which students feel most nervous or self-conscious. Nonverbal communication often includes fidgeting or looking away.

3.5 EFFECTIVE COMMUNICATION TIPS FOR THE CLASSROOM

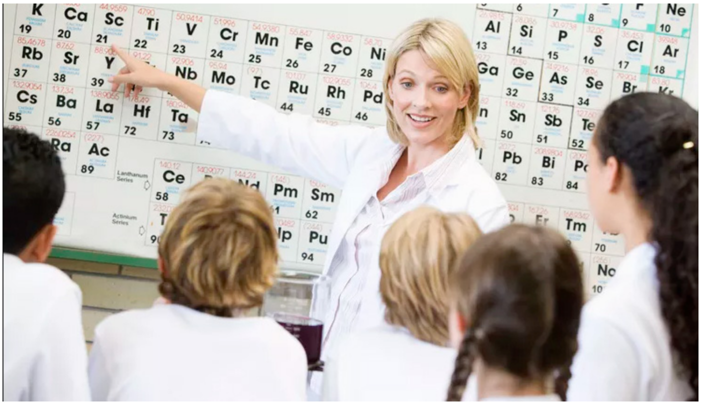
Effective communication is essential for a well-run classroom. Although this sounds simple and obvious, it requires much more than a teacher saying something out loud to a student.

3.5.1 Communicate Respectfully

Respect is the foundation of effective communication, especially in the classroom. Teachers and students demonstrate respectful communication in the following ways: - Use a tone that is honest and tactful, choosing words that are appropriate to the situation and non-inflammatory. - When taking on a listening role, make eye contact and focus on the speaker.

- Speak in turn, never interrupting the speaker. Teachers who model respect with their students have more respectful classrooms overall because students learn how to communicate respectfully and see its effectiveness.

3.5.2 Repeat Your Message in Different Ways



While most communication in a classroom starts verbally, many students don't take in what they hear the first time. Effective communication requires using different techniques in communication. When you want to make a point, consider what visual tools can help you in addition to your verbal communication. For example, if you are discussing rules of conduct, have a chart handy with graphics to help students remember. In a lecture situation, offer hand-outs that outline the points you are making. Give the students something to do that reflects the idea you are communicating. Repeat yourself at least twice verbally and offer something for students to look at, hold, or do that will also reinforce your message.

3.5.3 Check for Understanding

A teacher should always check for understanding. The simple question, "Do you understand?" will not result in much information, as most students will either nod or sit passively. Students can write down one sentence that summarizes what they think the lesson or lecture was about, or they can write a question they have about the lesson. In a one-on-one conversation, a teacher should ask the student to repeat the main point or outcome of the conversation.

3.5.4 Nonverbal Communication

Everyone communicates nonverbally through facial expressions and gestures. Effective communication in the classroom requires careful use of these nonverbal cues. A teacher who rolls her eyes at a student's question sends a louder message than her careful and expert verbal response. A disapproving stare can work wonders on a student who is off task. A bright smile for a student who is having a bad day means more than he will ever reveal. Gestures and animated facial expressions also give weight and enthusiasm to what a teacher has to say. Students who see a teacher actively engaged in what she is teaching will be much more engaged themselves.

3.6 COMMUNICATION AND LANGUAGE

Two foundational components of education are language and communication. Without communication, learning cannot happen. However, among English learners with significant cognitive disabilities, communication may look different.

Language may also manifest somewhat differently in this population, but its structure and consistent shared meaning allow for more complex thoughts and learning.

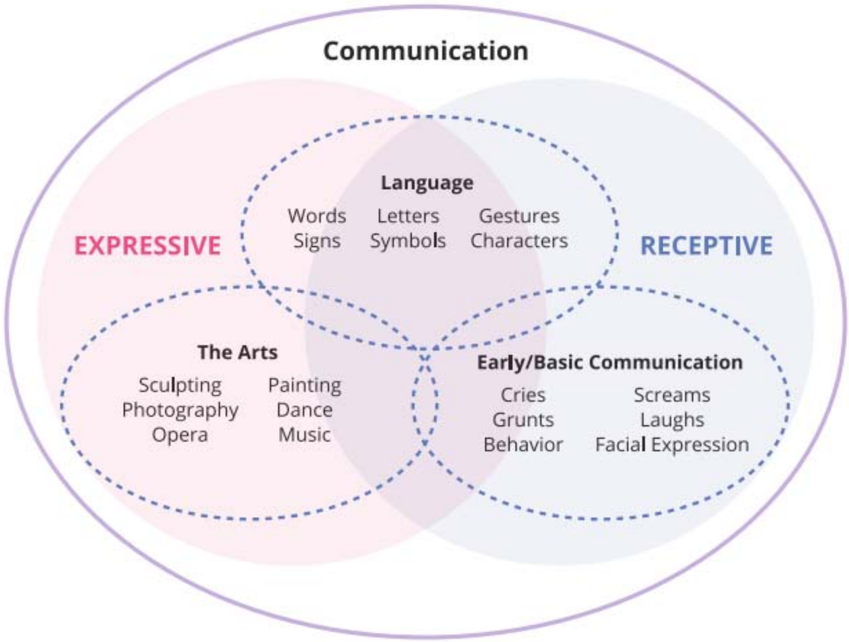
Therefore educators must have a deep understanding of communication and language, and of how students in this population use both. When seeking to identify how English learners with significant cognitive disabilities learn language and communicate, educators must clearly distinguish between language and communication.

3.6.1 Defining Communication

Communication is a core function of human existence. As social beings, humans seek to communicate with each other, using a variety of tools from the time they are born.

These tools include sounds, gestures, expressions, symbols, and words, among others. Communication is a social event that requires sending and receiving messages with shared understanding of meaning.

The tools available for communication expand as a person grows and learns. For example, babies can use tools, such as crying, body movements, smiling, and grunting; as they develop and are exposed to more interactions, knowledge, and experiences, they can learn new ways to communicate with facial expressions, written/oral/sign language, dance, music, and other tools.



Communication depends on the production or expression of a message and its reception. That is, a shared understanding of meaning is essential to effective and meaningful communication. This shared meaning must be developed through social interaction, or among participants. Just as a new parent grows to learn the meaning of different cries from an infant, meaning expressed through other aspects of communication including language, the arts, and expression, must be learned or discovered, and shared to be useful.

3.6.2 Defining Language

Language is "a complex and dynamic system of conventional symbols that is used in various modes for thought and communication". Learning and using language is a complex process that requires knowledge beyond the words themselves to be used effectively. The American Speech-Language-Hearing Association describes contemporary views of human language as evolving within specific contexts, being governed by phonological, morphologic, syntactic, semantic, and pragmatic rules. Language is learned and used through interaction of biological, cognitive, psychosocial, biological, and environmental factors, and its effective use requires a broad understanding of associated factors such as nonverbal cues, motivation, and sociocultural roles.

Language is a structured and shared form of communication like spoken and written words, figures, characters, and gestures, or a combination of these. Language includes rules that dictate word order, tense, social use, and these apply differently depending on the culture in which the language is used. As with other forms of communication, language depends on shared meaning and an increasingly complex understanding of the associated rules and structures. As language is learned, receptive language skills, listening and reading) are almost always stronger and more developed than productive counterpart skills (speaking and writing). Accordingly, language learners with and without disabilities often understand more than they can verbally respond to with accuracy.

3.6.3 Communication and Language in Schools

Considering the fundamental role of communication within society, the development of a student's communication system is an essential undertaking of schools, especially for students who do not have an effective means of communication when they enter school. The importance of language development cannot be understated and must be addressed holistically, incorporating all four domains (reading, writing, listening, and speaking) for all students learning English, including those with significant cognitive disabilities. These students (including those with significant cognitive disabilities) require a communication system and language foundation that allow for increasingly complex thoughts and ideas to arise and be expressed.

With a command of only basic communication tools such as crying and laughing, a child has the ability to communicate reactions to experiences. A child can get excited and smile when arriving at school, cry to express displeasure, or laugh at something that is observed. At this stage, adults must engage in a significant amount of guessing to establish common understanding. As children increase their grasp of additional communication tools and basic language skills, communication is clearer and opportunity expands for educators to incorporate more complex ideas and concepts into the student's school experiences. Students may identify their likes more directly by pointing at a picture, for example. They can also express their dislikes by moving papers away from themselves during a task. As language grows, students can express their thinking using traditional forms of speaking and writing, or with augmentative/alternative communication (AAC) devices designed to meet their language needs. Such devices may include word books, iPads, or eye gaze-operated systems. The size of a child's world correlates directly to their ability to use language: as they expand their skills, they expand their world. Their experiences, thoughts, opinions, and passions are all more easily accessible and available for sharing as their knowledge of complex language grows.

Similar to the English learner population at large, peer interaction is a critical element in the development of communication and language skills for English learners with significant cognitive disabilities. Students need peers who can model communication systems and strategies. Students also need peers, both native English speakers and English learners who can model English. Peer interaction also typically provides foundational motivation for students as they are developing their communication and language skills.

Language acquisition follows a typical order regardless of language. Learners of language, however, do not move lockstep in language development; individuals learn at various speeds and use a variety of methodologies, strategies, and tools, but all individuals can learn to use language. At the same time, language may not take the same form across students, especially among English learners with significant cognitive disabilities. In this population, students are often aided in their expressive communication in language by tools such as using eye gaze in response to a question (demonstrating listening comprehension) or in selecting words to compose a sentence (writing). Nonverbal students may use assistive technologies like a speech generating device or text-to-talk applications, whereas others may benefit from audiobooks to assist with comprehending written text. While these may not be traditional methods of communication, research shows they help students develop and use more complex language over time, aiding in their independence, academic development, and social engagement. Regardless of the communication and language tools employed by a student, those people with whom the student interacts must know what to expect from the student and how to respond.

Combining expertise from the field of second language acquisition with best practices in developing communication systems and teaching students with significant cognitive disabilities will provide the best starting point for addressing all the communications and language needs of students in this target population. Professional development across these areas will provide a solid foundation for professionals serving language learners with significant cognitive disabilities. Shirking the responsibility to address the

anguage needs of English learners with significant cognitive disabilities in addition to their basic communication needs can significantly limit students' abilities to develop essential skills to be workplace ready and participate in post-secondary and community activities independently or with support.

The focus of schools must include communication, language, and academic growth for all students including those in this target population. English learners with significant cognitive disabilities who need communication intervention require intervention in both languages—the one they hear at home and the one they are learning at school. What they understand in their home language may far exceed what they understand in their new language.

Knowing what students are capable of in their home language may be helpful to educators in supporting the student's language and communication needs at school.

3.6.4 Misconceptions

Several misconceptions exist about English learners with significant cognitive disabilities and their communication and language learning abilities, strategies, and needs.

The first misconception is that English learners with significant cognitive disabilities are limited by their disabilities to only basic communication and language development. This widespread misconception is detrimental to students because it can lead to lowered expectations and inhibited opportunities for growth. While some experts believe this population is incapable of developing complex language, research shows otherwise. The characteristics of students with significant cognitive disabilities indicates that approximately half of these students use abstract language and 70 to 82 percent use symbolic language. All individuals and their behaviors (including gestures, cries, noises) communicate some kind of message. While some English learners with significant cognitive disabilities may enter school with only simple expressive communication tools under their command, when provided the proper support, they can develop complex expressive language skills and learn to use communication systems that support their independence. English learners with significant cognitive disabilities who need communication intervention require intervention in more than one language, the language(s) used at home and in their community, and the language used at school. Their communication in their home language may far exceed what they can do in their new language.

Another common misconception is that students in this population are not prone to growth in language acquisition or academics. The highest proportions of students who performed consistently on language tasks were at the high school level followed by students at the middle and then elementary level. These finding indicate these students do indeed respond to effective instruction and demonstrate growth similar to their non-disabled peers.

Misconceptions are found in efforts to erase the uniqueness of these dually qualified students. Statements such as "All of my students are English learners" negate the distinct needs of English learners with significant cognitive disabilities. These students often have significant exposure to more than one language during the course of their daily lives. This exposure and the demands of operating in different languages for different contexts creates needs that are unique to English learners, with or without disabilities. These needs are present even if a student's language acquisition is only in the early stages of development in any language. The assumption that these students are not significantly different from non-English learners with significant cognitive disabilities can lead to an omission of essential instruction and learning that would greatly add to the student's learning and lived experiences were they received regularly.

Another commonly shared misconception is that students who do not respond do not understand. Understanding that receptive language skills, listening and reading, usually develop before expressive language skills (speaking and writing) helps people remember that students who do not respond to language still understand. Students understand more than they can express. As they engaged in more language exchanges and receive more structured language instruction, they develop the ability to express themselves and the skills to respond. This is especially true if students must communicate in two languages and also communicate with pictures/symbols.

The most important misconception to dispel, though, is the idea that because these students have significant cognitive disabilities, they do not benefit from English language services. This misconception means many students in this population do not receive language development services because school personnel feel that needs generated as a result of their disabilities outweigh their need for language development, or because school personnel feel that limited resources are better utilized with other students.

However, English learners with significant cognitive disabilities do benefit from language services. As with other English learner populations, leaving the development of language to educators without that expertise limits the ability of these students to acquire language, especially academic language. While special education teachers or speech language pathologists are well trained in helping students develop systems for communication, specialists in English language development contribute needed expertise in the education of English learners with significant cognitive disabilities as they can help students develop the tools and sequence, and provide explicit instruction to develop language skills.

3.6.5 Considerations

The consequences of not addressing the language and communication needs of English learners with significant cognitive disabilities while they are in school limits their options upon leaving school has repercussions across all areas of the student's life. As more light is shined on language learners with significant cognitive disabilities, more emphasis must be placed on what these students can do.

More resources must also be applied to facilitating their social and academic progress and maximizing their potential through communication and language development in all of the languages the student must use. These resources will need to include professional time for teachers/therapists with diverse specialties to collaborate and learn from one another in support of students' growth. Collaboration could include acquiring broader knowledge around the high-tech, mid-tech, and low-tech communication supports and tools available to students with significant cognitive disabilities, as well as how these tools can be used in various settings to support students as they grow. Identifying appropriate tool to support specific students may also be an area of focus for educator collaboration.

Resources should also include an array of augmentative and assistive communication (AAC) options, both high and low tech, as one device will not address the spectrum of communication needs among students. At times AAC devices should be treated as a student's voice in the classroom, not as toys or distractions only to be used during free time. Further, to implement a comprehensive communication program for English learners there should be designated resources for meeting the needs of students, teachers, and therapists who may need to be involved. In addition, peer modeling and interaction using AAC is essential, not only to help students feel more comfortable using the device, but also to support authentic communication exchanges. Of course, it is also important to remember that these devices are "augmentative" and so if other forms of communication are available to the student—a smile will do, for example—the student should not be made to use a device.

Finally, schools must not shirk their obligation to be the central support for English learners with significant cognitive disabilities to develop communication and language skills. The federal government tasks public schools to serve all students, even those with complex needs. Schools must avoid the unintended consequences of not addressing communication and language for these students. Identifying communication needs and creating solutions that students can use in all aspects of life and in all relevant languages will help these students achieve academically, develop socially, and grow personally, which will help them more fully participate in school, as well as within the workforce, their community, and their family.

3.6.6 Encourage Language and Communication Development in a Classroom

The ability to produce what we think, in speech requires choosing the right word and making sense to the other person. Communication is of great importance when it comes to making decisions and acquiring knowledge. Students need to develop these skills as early as possible and the best way to catch hold of such a skill will be to learn it from their teachers. Students spend a long time of the day with their teachers. In this time, if the teacher can focus on developing language and communications, it will do wonders for the student in future.

Having a strong grip over language and communication will help the student become confident. They will be able speak their mind out, without thinking about whether they will make sense or if they are saying the right things.

It will help them when they grow up and take up jobs, as most of the jobs require excellent communication skills. With such a skill in their pockets, students can look forward to a bright future.

Be Attentive and Listen

The first step to develop the communication skills is to listen. You will need your students to understand this. To do so, you will have to set the example first. Whenever they tell you something or come forward to talk to you, you should be listening to them with full attention. Do not ignore or hush them away, because you are not interested. The students will reciprocate in similar manner when you want them to listen to you.

Talk and Discuss

Have group discussions and debates in classroom about relevant topics. Even while you are teaching, ask questions and wait for students to take the first step and reply back to you. Though some teachers may not encourage the talking of students with each other, but during discussions, let them have a chat about the topic. The teacher must take the role of the moderator. Make sure the point of discussion doesn't get lost.

Use new Words

While you are taking a class, or just having a chat with your students, make sure you use new words in your sentences. Make sure the students get the context, and if it looks like they don't then explain the meaning to them. But while you are at it, don't fill up all your sentences with just new words. Doing this might cause the students problem in understanding what you are trying to convey, especially when you are teaching a new concept.

Provide Names of Books and Documents

You might not be able to provide all the students with books, but you can communicate the names, or websites or magazines the students can read through. You can try out giving assignments that revolve around reading up. Make sure the students go to library and are taking up books and documents from there. It might not be possible that the whole class will follow you, but there will be few students who will take active participation.

Use Signs

While teaching complex concepts, include gestures and signs. This will help the students to provide a meaning to the word, the sentence and the concept while making things easier for them to understand. You can even draw on the board, and if you aren't that great at drawing, use a projector and show images or videos.

This will get the students' attention, and you will find it that they understand the concept in a much better way.

Public Speaking

Have a session with you students, where each of them will have to talk about something or explain it in front of the whole class. But don't just stop there, make it interesting. While they speak give them a word every 15 second, which they will have to use in their speech. Make sure every student gets to do this and that this is continued over a long period. What happens is, students who fear to talk in front of others will find it easier as time goes on. Moreover students will be learning from each other. You can have a question and answer session for 10 minutes, after everyone has spoken.

Communication comes as a huge help when one goes for interviews and has to work with other people in top notch jobs. The power of speaking and convincing helps to spread one's career and personality in the right way. Teachers are the ones who can help the students' to reach such heights.

3.7 BARRIERS OF CLASSROOM COMMUNICATION

Communication is an important part of teaching because the students have to be able to understand the message that the teacher is trying to convey. Students also have to be able to communicate effectively with each other. There are a number of factors in the classroom (and many of these factors exist in day-to-day life as well) that can act as barriers to effective communication.

1. **Verbalism:** Excessive verbalism can no longer be condoned, particularly in today's world of communication which offers much more effective substitutes from other avenues of expression. Such verbalism is a definitely limiting barrier of effective classroom communication.

2. **Anxiety:** One of the major emotional causes of communication barriers is a student's anxiety. If a student is anxious and unsure, they're less likely to speak up in class. This is true even in situations where a student doesn't understand what the teacher is saying and needs clarification. Anxiety stops students from participating in group discussions because they don't want to be made the center of attention, and they're afraid of other people's opinions of them.
3. **Language:** Language is the primary way of communication thoughts and ideas. If the teacher and the students don't speak the same language, these can be a major communication barrier. If the teacher speaks English, and the students are mostly English as Second Language students, then there will be communication problems, since the students may not understand everything the teacher says.
4. **Expression:** Communication is never exact. The initiator tries to put his ideas into words, and then the recipient has to decode those words to understand the idea. When the teacher or student doesn't have the ability to choose the proper words to describe the ideas they want to convey, this will create a communication barrier in class room. An example of this could be a teacher who is a professional mathematician, but an ineffective math teacher because the only way she can convey ideas is to use math jargon that the students cannot understand.
5. **Reference Confusion:** Different explanation and different application of the same word convey different meaning to every one of the students for each of their background varies and thus influence interpretation and understanding that reference confusion occurs. For this reasons proper communication between the teachers and students are not possible. Reference confusion is common in reading. The ability of two people to use the same words and arrive at completely different understandings

is one of the grate dangers in our classrooms. Different areas of knowledge, experience, background etc. are responsible for reference confusion.

6. **Day dreaming:** A common (though avoidable) barrier to effective communication occurs when the learner day dreams, that is when he turn away from the flow of classroom communication and dwells upon his own privately recalled understanding and experiences, which are more preoccupying than those which are identified with classroom activity. Students are failed to keep their full attention in the class room, if they think the movie that was seen by them in previous night. As a result they cannot give their proper attention to the lecture of the important teachers that creates a great problem in class room communication. This barrier can be lessened or surmounted by. Increasing the understandability of class room communication through the use of effective audio visual class room techniques.

7. **Imperceptions:** Students are not be able to understand the teacher's important class lecture if they have any physical problem. Psychological function can do nothing in this case. So students may gather knowledge very superficially in class room thus communication fails.

8. **Disinterest:** Disinterest arises among the students due to the lack of available teaching materials, teaching system and efficient teacher in the classroom. To eradicate distance teacher should include some motion pictures, films, modems, specimens, film strips, charts, diagrams, tapes, records, television and many other audio visual materials. Variety in class room procedures and teaching materials usually heightens the interest and enthusiasm with which pupils approach their work.

9. **Physical discomfort:** Student may fell discomfort due to the insufficient necessary internal or external equipment in the class room like fan, light, air, etc. for these reason,

they may lose their interest to hear the lecture of their teachers. This type of barrier should also be considered in a classroom for proper communication between students and teachers.

The modern class room must be thought of as providing an efficient environment for learning. This environment should be characterized by light control, which permits the use of projected materials, by temperature control which encourages mental activity, all these will be controlled by the teacher of the class room.

3.7.1 Others barriers of classroom communication or highly influencing factors in communication:

- **Location or distance barriers:** This barrier is particularly important when speaking to a group or audience. If the audience perceives you as distance from them, looking down on them, or simply not reachable, then they will not be as receptive to the message you are trying to share. For example, if you are standing on a stage and never venture out into the audience, the distance itself can send a message contrary to the one you intend.
- **Lack of common experience:** If you are using technical term or other language your audience does not understand, you will miss the mark. Even an audience that should be sympathetic to you could end up providing negative feedback because you chose to speak only to your own level of knowledge or experience rather than considering theirs.
- **Language barriers:** Buzzwords, jargon and slang are very specialized. Using them will always prevent some portion of the potential audience from understanding your message. That includes people who might benefits from your message, if it were presented in a way they understood.

- **Gender barrier:** It has been demonstrated in studies that women communicate more on a regular basis than men do. Though both sexes have both sexes have booth kinds of communicators, women are more likely to be right-brain communicators — abstract and intuitive. Men are more likely to be left-brain communicators – linear and logical. Depending on your own makeup, this could be a barrier. Both men and women have to learn how to communicate in a way that allows both sexes to receive and understand the message.
- **Lack of credibility:** If it's evident that you're speaking strictly from book knowledge, rather than personal experience, or if your audience does not see how what you are saying could possibly be true, this creates a credibility problem. The audience will suspect that you don't know what you're talking about. As a sender, you need to make sure that the stories you tell don't lead the audience to question your credibility and authenticity.
- **Age factors:** The understanding capacity of different ages pupils are different. The senior student understands anything rapidly and sufficiently than junior one. Thus the age factor from person to person, place to place and communication are varies.

3.8 CLASSROOM STUDENT–TEACHER INTERACTION

Student–teacher interaction, both in and out of the classroom, is influenced strongly by the teaching perspective embraced by the teacher. Within the instructional communication discipline, teaching can be viewed from two perspectives: the rhetorical perspective and the relational perspective. Teachers whose student–teacher interaction is governed by the rhetorical perspective communicate with their students as a means to influence or persuade them. Communication is teacher-centered, which means that teachers send a message to students who play a passive role as the recipient of the message. To communicate effectively with their students, teachers focus on teaching clearly, making course content relevant, and acting in an assertive manner. In essence, their in-class communication behaviors center on performing their classroom functions as lecturer and discussion leader and managing the classroom.

3.8.1 Teacher–Student In-Class Communication

Teacher–student in-class communication revolves around the primary communicative roles played by the teacher. Two of these roles are teacher as lecturer and teacher as discussion leader. The lecture enables teachers to communicate large amounts of information organized in a way to appeal to many students at the same time. For the lecture to be effective, it must have the appropriate breadth and depth of content, be organized in a logical pattern, and contain the appropriate amount and type of examples. Teachers must also strive to engage in effective communicative behaviors when lecturing. These communicative behaviors include being clear, making the content relevant, and using humor. When engaged in teaching with clarity, teachers communicate their expectations clearly, stress key points, provide preview and review statements, and describe assignments.

Clear teachers are concerned with not only the clarity of course content, but the clarity of course procedures, course policies, and course expectations. When making content relevant, teachers communicate content relevance through the use of examples, explanations, current events, and experiences. Teachers who are relevant are concerned with making the connection between course material and students' career goals, personal goals, and personal needs. When using humor, teachers communicate through relaying humorous stories, anecdotes, and jokes, and by exaggeration. Humorous teachers make sure their humor is related to the course content and is used to clarify key points made in the lecture. Thus, by incorporating clarity, relevance, and humor in their lectures, teachers are able to enhance student learning. Additionally, when teachers are clear, relevant, and humorous, students report that they liked their teacher, liked the course, and were motivated to study.

When leading discussion, teachers rely on asking questions as their primary communicative tool. By asking questions, teachers can assess whether students are learning, are interested in the course content, or are simply paying attention. Many teachers rely on asking recall and clarification questions to determine whether students are learning or paying attention, but other forms of teacher questions exist. These teacher questions are exploratory, diagnostic, action, cause-and-effect, and summary. Exploratory questions ask students to probe known facts; diagnostic questions ask students to probe motives or causes; action questions ask students to develop a course of action; cause-and-effect questions ask students to derive a causal explanation; and summary questions ask students to synthesize content. Whatever the type of questions teachers ask, these questions are designed to challenge and involve students in classroom interaction.

Teacher communication is also central in classroom management. Classroom management refers to the communicative behaviors used by teachers to regulate and control student classroom behavior. Some of the communicative behaviors used by teachers are messages rooted in teacher power and influence and behavioral alteration techniques. Messages rooted in teacher power and influence enable teachers to persuade students to behave in ways that are appropriate for the classroom. Two of these messages include teacher expert power and teacher referent power. Teacher expert power refers to student recognition of the teacher as a content specialist and teacher referent power refers to student recognition of the teacher as a likeable person. When teachers use expert power and referent power messages, students report that they liked the course, learned something from it, are satisfied with how their teachers communicated in the course, and consider their teachers to be competent and trustworthy. Moreover, students are more likely to behave and respond to their teachers' requests to behave, which emerge in the form of behavioral alteration techniques. Behavioral alteration techniques are 22 strategies used by teachers to gain student compliance using either a positive or a negative tone. When teachers use prosocial techniques, students are more likely to respond positively to teacher influence attempts; when teachers use negative techniques, students are more likely to resist teacher influence attempts.

Conversely, teachers whose student–teacher interaction is governed by the relational perspective communicate with their students as a means of developing a relationship. Communication is mutually created and shared between students and teachers, with an emphasis on the role of shared emotions and feelings used by students and teachers to respond both affectively and effectively to each other. To communicate effectively with their students, teachers use affinity-seeking strategies and immediacy behaviors, are supportive and confirming, and use humor.

Through the relational perspective, student–teacher interaction is viewed as collaborative in that student–teacher interaction is interpersonally driven and relationally oriented. Implicit in this argument is the notion that students and instructors engage in communication in order to develop professional working relationships with each other. The relational perspective can account for student–teacher interaction, which impacts whether and how students are motivated to communicate with their teachers, whether students participate in the classroom, and whether students engage in out-of-class communication with their teachers.

3.8.2 Student Communication Motives

Whether student–teacher interaction occurs may be dependent on whether or not students are motivated to communicate with their teachers. Student communication motives refer to the primary reasons for students to communicate with their teachers. Researchers have identified five communication motives. These motives, or reasons, are relational, functional, participatory, excuse-making, and sycophancy.

When students communicate with teachers for relational reasons, they are doing so to learn more about the teacher on a personal level. Students may perceive their teachers as having similar interests, sharing the same background, or having the potential to become a potential friend. When students communicate with teachers for functional reasons, they are doing so to acquire needed information about the course. Students may ask questions or use information-seeking strategies to learn about course expectations, to understand the material, or to clarify the requirements for assignments, exams, and projects. When students communicate with teachers for participatory reasons, they are doing so to demonstrate their involvement in the course. Students may answer questions, offer examples, or challenge teachers' comments to demonstrate that they are genuinely interested in participating in class discussion or class activity. When students communicate with teachers for excuse-making, they are doing so to provide a reason as to why their academic performance is suffering. Students may offer excuses for why they are tardy, why they are absent from class, or why their assignments are incomplete or not finished at all. When students communicate with teachers for sycophantic reasons, they are doing so in order to make a favorable impression on teachers. Students may engage in conversation, answer questions, or appear interested in the course content because they want to be viewed positively by their teachers.

When students communicate with their teachers for relational, functional, and participatory reasons, they report that they liked the course, learned something from it, are satisfied with how their teachers communicated in the course, and are motivated to study. Students who communicate with their teachers for relational and functional reasons also report that they liked the teacher. Conversely, students who communicate for excuse-making and sycophancy reasons do not indicate any positive links between their communication with their teachers and their liking, learning, or satisfaction and this motivation. These findings suggest that when students communicate with their teachers for relational, functional, and participatory reasons, their educational experience is affected positively, whereas when they communicate with their teachers for excuse making and sycophantic reasons their educational experience is not affected at all, whether positively or negatively.

At the same time, whether students are motivated to communicate with their teachers is dependent on the interpersonal communication behaviors used by teachers. Generally, when students are motivated to communicate with their teachers, they perceive their teachers as being approachable, as friendly yet challenging, as responsive yet assertive, and as possessing the communication skills necessary for functional relationships. They are also motivated to communicate when their teachers use verbal and nonverbal immediacy behaviors and use pro-social classroom management techniques. Moreover, students are motivated to communicate with their teachers when they consider their relationships to be of high quality and unlike the relationships the same teachers have with other students.

3.8.3 Student In-Class Participation

One way in which students' reasons for communicating with their teachers may surface is through their in-class participation. In-class participation, which is defined broadly as the comments offered and questions asked by students during class time, encapsulates the questions students ask, the clarification tactics and the informationseeking strategies they use, and the challenge behaviors in which they engage.

Asking questions is perhaps the most fundamental process through which students participate in class. By asking questions, students can request help, signal a lack of comprehension, request additional information, and check a point of view. College students generally ask five types of questions: classroom procedures, general inquiry content, clarification, confirmation, and general inquiry teacher. Classroom procedures questions center on course assignments and exams, the syllabus, and general classroom management; general inquiry content questions are factual and revolve around the subject matter; clarification questions focus on further elaboration of the subject matter; confirmation questions center on student requests for affirmation; and general inquiry teacher questions seek personal information about the instructor. Although it is estimated that 95 percent of students have questions, college students typically only ask three to four questions per hour of class, and these questions are asked primarily to request clarification and inquire about classroom procedures.

Clarification tactics refer to the questions asked or statements made by students through which students indicate they need additional information in order to enhance their understanding of the subject matter. College students use a variety of clarification tactics. These tactics include: ignoring the problem; asking the teacher to elaborate, provide an example, rephrase the content, or repeat the material; asking the teacher a specific question; indicating confusion via a quizzical look or brief phrase; and checking to determine if the content was interpreted accurately. Other clarification tactics include asking classmates, asking the teacher to speak more slowly, and asking the teacher for written material. Of these clarification tactics, asking the teacher to elaborate, to provide an example, and to repeat the material are the most commonly used tactics, although the use of each tactic can depend on class size and instructional format.

Information-seeking is defined as the process by which students acquire feedback through the use of information-seeking strategies, and is used when they are unsure of how their performance is being evaluated. Five information-seeking strategies used by college students are the overt, indirect, third-party, testing, and observing strategies. The overt strategy is the only strategy that involves direct interaction between two individuals; an indirect strategy entails either hinting at the information or getting the target to provide the information without explicitly being asked; a third-party strategy requires an individual to solicit the information from someone other than the target; a testing strategy involves an individual deviating from the organizational or institutional norms in the hopes of being noticed; and an observing strategy requires little or no interaction between the information seeker and the target. Among college students, the overt information-seeking strategy is used the most frequently and the testing strategy the least frequently, although the use of each strategy may depend on students' perceptions of whether the classroom climate is supportive or defensive and whether teachers use communication behaviors that invite students' use of each strategy.

Challenge behaviors are strategies used by students specifically in an attempt to reduce their uncertainty about classroom rules, expectations, power, and explanations. Four challenge behaviors used by students are procedural challenges, evaluation challenges, practicality challenges, and power challenges. Procedural challenges focus on students testing the classroom "rules," which may be stated by teachers or included in the course syllabus; evaluation challenges arise when students question teachers' grading methods, grading scales, or measurement tools; practicality challenges occur when students question the relevance or salience of course assignments or tasks; and power challenges arise when students attempt to exert influence over teachers or other students. All four challenge behaviors are used steadily by students throughout the course of a semester and across all academic disciplines.

3.8.4 Out-Of-Class Communication (OCC)

Out-of-class communication (OCC) between student and teacher is defined broadly as "structured and unstructured activities or conditions that are not directly part of an institution's formal, course-related instructional purposes".

These activities or conditions include students' use of scheduled or impromptu office visits; e-mail messages and telephone calls; running into faculty on campus, at campus events, or off campus; stopping to speak with faculty in the corridor or during class breaks; speaking with their instructors before and after class; and scheduled advising sessions. OCC is initiated primarily by students and occurs most frequently in the form of office visits.

Although the number of students who participate in OCC varies, its content is restricted to several topics. Some of these topics include students inquiring about course related information, engaging in self-disclosure, seeking advice, engaging in small talk, sharing intellectual ideas, asking instructors for favors, discussing future career plans, and discussing campus issues, although inquiries about course-related information are the most frequently reported OCC topic.

Students who engage in OCC report a better educational experience than students who do not engage in it. Similarly with the research findings on students' motives to communicate with their teachers, student learning outcomes are linked positively to OCC. When students engage in OCC, they report that they like their teacher, liked the course, learned something from it, are motivated to study, and are satisfied with how their teachers communicated in the course. Students also are more likely to discuss what they have learned in the course with their family and friends, and report that they consider their teachers to be trustworthy, empathic, and as possessing the ability to mentor.

At the same time, whether students are motivated to engage in OCC with their teachers is dependent on the interpersonal communication behaviors used by teachers. These interpersonal communication behaviors include whether teachers are assertive and responsive, engage in verbal and nonverbal immediacy behaviors, use humor, utilize affinity-seeking strategies, and use functional communication skills.

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CHAPTER 4

MODELS OF TEACHING

INTRODUCTION

The term model is used to mean a teaching episode done by an experienced teacher in which a highly focused teaching behavior is demonstrated, in it an individual demonstrating particular patterns which the trainee learns through imitation. It is a way to talk and think about instruction in which certain facts may be organized, classified and interpreted. Bruce Joyce and Marsha Weil describe a Model of Teaching as a plan or pattern that can be used to shape curricula, to design instructional materials and to guide instruction in the classroom and other settings. Thus teaching models are just instructional designs. They describe the process and producing particular environmental situations which cause the student to interact in such a way that specific change occurs in his behavior. It helps in designing instructional activities and environmental facilities, carrying out of these activities and realization of the stipulated objectives." Models of Teaching are designed for specific purposes-the teaching of information concepts, ways of thinking, the study of social values and so on-by asking students to engage in particular cognitive and social tasks. Some models center on delivery by the instructor while others develop as the learners respond to tasks and the student is regarded as a partner in the educational enterprise.

4.1 TEACHERS' USE OF MODELS OF TEACHING

Models of teaching provide well-developed ways of teaching that guide the development of learning experiences and the identification of structures that support learning. Teaching models indicate the types of learning and outcomes that could be anticipated if they are used. Researchers believe that using a variety of models is a characteristic of excellent teaching. The central question in this study was: How frequently are models of teaching used within a school system? Findings among participating teachers (N=94) demonstrated that a model of teaching was used less than one-quarter of the time, while no model of teaching was observed more than three-quarters of the time. Using the models of teaching framework as the platform for assessing instruction offers an opportunity to promote faculty member awareness about school-wide practices and to inspire change.

Students' learning and study habits are influenced by instructors' use of teaching models. In a study of university teaching Carry reported that when students at risk for academic retention understood how instructors used models of teaching, they were able to adjust their study habits and prepare for class more effectively. Yet despite these studies, how teaching models influence student outcomes remains largely unknown. Obtaining insight about the nature and attributes of classroom instruction can help school leader's work more effectively with school staff when they seek to understand the quality of instruction across the school. The authors are not advocating for any particular types of teaching models. We also acknowledge that the use of more than one teaching model may be appropriate when particular student outcomes are sought. When students are learning how to problem-solve, for example, the use of the scientific thinking, inquiry training, and/or group investigation models may be needed.

4.1.1 Models of Teaching

Models of teaching are conceptual frameworks that assist teachers in helping students learn how to learn. Grounded in major philosophical and psychological orientations towards teaching and learning they are prescriptive strategies that help teachers define their responsibilities during the phases of planning, implementing, and evaluating teaching. Initially teaching models were developed after researchers became interested in understanding how learners' characteristics and aptitudes affected student outcomes. Subsequently Joyce and Calhoun classified these models into four families: information-processing, social, personal, and behavioral systems approaches.

The information-processing family of models can enhance students' ability to accommodate new information while they are learning. These models provide a framework that assists students in acquiring and organizing information, identifying and solving problems, learning concepts, and constructing knowledge.

The social family of models capitalizes upon group interactions to build learning communities and to promote democratic processes. Group inquiry and problem-solving strategies are used to support students as they construct their own knowledge. Students rely upon their awareness of personal and social values to address issues. When students need to use scientific, social, or other relevant knowledge to make decisions about situations that have personal, social, or political implications the social models are recommended.

Each teaching model promotes instructional and nurturing [sic] effects. An instructional effect refers to change in skills or knowledge base. A nurturing [sic] effect refers to non-instructional growth such as a change in habits, perceptions of self, others or situations, and social or emotional growth. All of the models are characterized by: (a) phases of instruction, (b) recommended classroom structure, c) designated instructional supports, and (d) teacher and student roles. For each model the type of instructional practice that teachers are expected to demonstrate is described and the degree to which a learning environment (classroom structure) is teacher-centred or student-centred is indicated. The manner in which textbooks and other learning (instructional) materials can support student learning is presented. The roles that teachers demonstrate such as authoritarian, facilitator, or coach are also specified. The degree of expected student responsibility during learning is also described.

Although models provide a blueprint, a structure, and direction for teaching they do not serve as a substitute for teachers who lack requisite subject matter knowledge, creativity and interpersonal skills. No model is effective for every student; teachers need a range of models. They are, however, tools that 'help good teachers teach more effectively, by making their teaching more systematic and efficient'. Using a wide repertoire of models enhances students' ability to engage in different kinds of learning. Models are powerful strategies for teaching and learning that eliminate virtually all differences among students due to gender, race/ethnicity, and socioeconomic status.

The explicit use of teaching models can accelerate the students' rate of learning, lead to increased measures of academic achievement and increase students' capacity and facility in learning. As students' repertoire of learning strategies increases they can accomplish more types of learning effectively. Using varied teaching models ensures that all students receive experiences that correspond to their preferred learning styles and uses the range of perceiving and processing domains. How an educator selects a teaching model is influenced by his/her perception of the content and how it is taught best, which in turn influences his/her selection of the learning strategies, and the type of social interactions. Whether content is presented conceptually or contextually, whether or not teaching is passive or constructive, and whether or not the social climate is interactive or restrictive depends upon the model of teaching selected. Identifying appropriate learning experiences are central to the actual use of teaching models.

Methods of teaching influence what is learned and how well it is learned. Certain methods increase desired outcomes; other methods diminish intended outcomes. By using models of teaching students can be taught how to learn. Learning how to learn influences whether or not a student becomes capable of self-regulated and independent learning. Joyce and Calhoun claim that '. . . the most important long-term outcome of instruction may be students' increased capacity to learn more easily and effectively in the future, both because of the knowledge and skills they have acquired and because they have mastered the learning process'.

Models of teaching help teachers to clarify their objectives and to develop learning experiences that promote successful outcomes. Teaching models can lead to improvements in the quality of instruction because they emphasize the use of sound functional plans, the identification of clear goals, and help define the process and content of a lesson. Knowing what to teach promotes thoughtful planning which in turn improves the quality of instruction. Using a variety of instructional strategies helps teachers to engage students in meaningful ways, serves students' best interests and more closely matches the ways in which they learn best. When teachers knowingly use models explicitly they can be more effective in teaching students how to learn.

Teaching models hold promise for increasing student achievement. Administrators and teachers who are searching for best practices will find that models of teaching have the capacity to reach all students. The routine use of models: (a) facilitates students' ability to learn how to learn, (b) accommodates students' individual differences, and c) builds communities of learners. They illustrate how an organized approach to education can capitalize on students' unique potential productively.

Background for this Study

Approximately 18 months prior to this study, a new director was hired to initiate a restructuring effort in a school system that consisted of a single K-12 school. The director planned to help the faculty member restructure the school along the lines promoted by the Coalition of Essential Schools through a commitment to the: (a) creation of shared meaning and goals among participants, (b) provision of opportunities for collaborative planning, and c) provision of leadership designed to empower others. The results of this study were derived from the dataset of a larger study that characterized teaching within the entire school. In that study Behar-Horenstein and Seabert identified a typology of teaching behaviours as: Engaging students as learners, Prescribing learning, Controlling the milieu, Providing passive instruction, and Teaching without vision. The purpose of this present study was to describe the extent to which models of teaching were used during classroom instruction.

4.1.2 Method

The setting

The study was conducted in a free-standing K-12 school located in the southeastern United States where 1,200 students (65% white, 24% African-American, 10% Hispanic, and the remaining 1% Asian, American Indian, or multiethnic) attended. Approximately one-quarter of the student body received free/reduced meals. The overall school attendance rate was 95%. The administrative structure of the school consisted of a director and two principals who were responsible for "day to day" operations within the K-5 and 6-12 units.

The director's role was to coordinate the school's institutional and service goals and to serve as the liaison to national, state and local professional communities. Permission to conduct this study was granted by the university's institutional review board. Prior to beginning this study the researchers informed the school faculty about the purpose and methods of this case study during one of their regularly scheduled faculty meetings.

Running notes were recorded. Teaching behaviors that were recorded included:

- The tasks teachers asked students to do.
- A description of roles that teachers and students assumed and a description of their involvement in the lesson.
- A description of how the teacher facilitated student learning.
- A description of the teachers' responses to students' questions and answers.
- An identification and description of how instructional supports were used throughout the lesson.

Following each observation, the notes were transcribed. Each transcript was then analyzed to determine whether or not teachers explicitly used one or more teaching models during classroom instruction. The explicit use of a model of teaching was defined as an instance in which a teacher was observed using the instructional phases or syntax; the social system; principles of reaction (instructional roles) and the support system that were consistent with one of Joyce, Weil & Calhoun's (2000) teaching models.

Spradley's (1980) scheme of domain analysis was used during the inductive analysis of the data. Observations were coded independently by each of the researchers, both of whom are certified teachers, to ensure the trustworthiness of the domains and to ensure the 'fit between what [researchers] record as data and what actually occurs in the setting under study'. Multiple observations of instructors' teaching behaviors were conducted during prolonged engagement in the field (Creswell, 2004. Independent coding by the two authors corroborated the reliability of the observations (Patton, 2002).

These are based on the following specifications:

- Specification of Environment- It specifies in definite terms the environmental conditions under which a student's response should be observed.
- Specification of operation- It specifies the mechanism that provides for the reaction of students and interaction with the environment.
- Specification of criterion of Performance-It specify the criterion of Performance which is accepted by the students The behavioral outcome which the learner would demonstrate after completing specific instructional sequences are delineated in the teaching models
- Specification of learning outcome- It specifies what the student will perform after completing an instructional sequence. Effects of teaching by modelling Models of Teaching are really models of learning.

As we helps students acquire information ideas skills, values, ways of thinking, and means of expressing themselves, we are also teaching them how to learn.

Ln fact the most important long term outcome of instruction may be the students „increased capabilities to learn more easily and effectively in the future, both because of the knowledge and skills they have acquired and because they have mastered learning processes.

According to Joyce and Weil, Each model results in two types of effects

Instructional and Nurturant.

- Instructional effects are the direct effects of the model which result from the content and skills on which the activities are based.
- Nurturant effects are those which are implicit in the learning environment.

Bandura and Walters have formulated three kind of effect in teaching by modelling:

1. Modelling effect- The learner acquires new kind of response pattern.
2. Inhibitory and disinhibitory effect-
3. Eliciting effect- The learner receives from a model merely a cue for realizing a response.

Modelling effect can be seen when a teacher demonstrates to a student how to hold a pencil or write capital A and thus shows a new behavior. Through modelling the teacher lets the student know that it is not permissible of obscene nature in art book. The eliciting effect takes place when through modelling; a teacher tries to teach students to get up when he enters the room. Thus it provide a cue eliciting a response neither new nor inhibited. Gagne feels that learning through imitation seems to be more appropriate for tasks which are a little cognitive in nature.

4.2 UTILITY OF TEACHING MODELS IN TEACHING

- Teaching models are useful in developing social efficiency, personal abilities, cognitive abilities and behavioral aspects of the students. It helps in selecting and stimulating situations which causes the desirable changes in students
- Teaching models help to establish teaching and learning relationship empirically. It helps in making the teaching more effective.
- Teaching models helps in providing a theoretical rationale to the teaching, which will provide changes and rectifications in teaching.
- Teaching models stimulates the development of new educational innovations in teaching strategies and tactics, which may replace the existing ones in schools of today.
- Teaching models assist makers of materials to create more interesting and effective instructional materials and learning sources.

- Teaching models assist teachers to develop their capacities to create conductive environment for teaching, as its nature is practical.
- Teaching models help curriculum planners to plan learning activities and content material which provide a variety of educational experiences to learners.
- Teaching model evaluates the behavior of the students. For this important task, it presents such a criterion with the help of which the changes in the student's behaviors can be easily evaluated

4.2.1 Characteristics of a Teaching Model

1. Encourage Art of Teaching- Teaching is considered as an art.. Teaching models encourages this art by providing learning environment.
2. Development of Inherent Abilities -Teaching models bring about the qualitative development of personality as it helps in developing human abilities. It also increases the teacher's social competency.
3. Based on Individual Differences- Teaching model uses the student's interest, as it is constructed on the basis of individual differences.
4. Influenced by Philosophy- Every teaching model is influenced by the philosophy of education. Hence, teachers formulate different models of teaching under the influence of the philosophy they believe.
5. Answers Fundamental Questions- In every teaching model answers to all the fundamental questions pertaining to the behavior of students and teachers are included.
6. Providing Appropriate Experiences- Teaching models provides proper experiences to both teacher and student. Selecting the content and presenting it for learning before the students is the main essentiality of teaching. This difficulty is solved when a teacher presents appropriate

experience before the students.

7. Maxims of Teaching- The basis of teaching model is the maxims of teaching. They are the foundation of each teaching model.
8. Practice and Concentration- The development of a teaching model is based on regular and continuous practice and concentration. The proper development of a teaching model is only possible when the assumptions are made clear by related thinking.

4.3 FUNDAMENTAL ELEMENTS OF A TEACHING MODEL

Normally majority of teaching models are based on the following six elements:

4.3.1 Focus

Focus is the central aspects of a teaching model. Objectives of teaching and aspects of environment generally constitute the focus of the model. Every teaching model is based on one or the other objective as its focal point. Any teaching model is developed by keeping this focal point in mind. Every teaching model differs from another in terms of its objectives. It is the nucleus of a teaching model. Every model is developed by keeping in view its focal point or objective. Every model has various phases, some particular types of competencies are developed by it.

4.3.2 Syntax

Syntax of the model describes the model in action. Syntax includes the sequences of steps involved in the organization of the complete programmed of teaching. It is the systematic sequence of the activities in the model. Each model has a distinct flow of phases. It means the detailed description of the model in action. In it, the teaching activities and interactions between a pupil and the teacher are determined .The syntax of any teaching model means those points which produce activities focused on educational objectives at various phases. Under syntax, the teaching tactics, teaching activities and interaction between a student and the teacher are determined in such a pattern of sequence that the teaching objectives are achieved conveniently by providing desirable environmental situations.

4.3.3 Principles of Reaction

Principles of Reaction tell the teacher how to regard the learner and to respond to what the learner does. This element is concerned with the way a teacher should regard and aspects respond to the activities of the students. These responses should be appropriate and selective. They provide the teacher with rules of thumb by which to select model, appropriate responses to what the student does. This element is concerned with the teacher's reaction to the student's responses. In it, he comes to know that how he has to react to the responses of the students and has to see whether the learners have been actively involved in the process, or not.

4.3.4 The Social System

This element is concerned with the activities of pupil and the teacher and their mutual relationships. Every teaching model has separate objectives and will have therefore separate social systems. It is related with the interactive roles and relationship between the teacher and the student, and the kinds of norms that are observed and student behavior which is rewarded. The Social System describes the role of and relationships between the teacher and the pupils. In some models the teacher has a dominant role to play. In some the activity is centered on the pupils, and in some other models the activity is equally distributed. This element is based on the assumption that every class is a miniature society. In it also discussed the selection of motivating strategies and tactics for the students.

4.3.5 Support system

Support System describes the supporting conditions required to implement the model. „Support‟ refers to additional requirements beyond the usual human skills, capacities and technical facilities. The support system relates to the additional requirements other than the usual human skills or capacities of the teacher and the facilities usually available in the ordinary classroom.

Teacher requirements refer to special skills, special knowledge of the teacher and special audio-visual material like films, elf-instructional material, visit to special place etc. This includes books, films, laboratory kits, reference materials etc. It means the additional requirements beyond the usual human skill, capacities and technical facilities.

In it, the evaluation is done by oral or written examination, whether the teaching objectives have been achieved or not. On the basis of this success or failure, clear idea is achieved regarding the effectiveness of strategies, tactics and techniques used during teaching.

4.3.6 Application

It is an important element of a teaching model. It means the utility or usage of the learnt material in other situations. Several types of teaching modes are available. Each model attempts to desirable the feasibility of its use in varying contexts related with goal achievements in terms of cognitive, and affective behavior modification.

4.4 TYPES OF TEACHING MODELS

Every teaching model has its specific objective. In order to achieve the objective of a teaching model, the teacher has to choose right type of model for achieving the particular objective. The teaching models have been classified into three main types:

1. Philosophical teaching models: Israel Safer had mentioned such types of models. These include

- The Insight model (Plato).-The insight model discard the assumption that the meaning of of a teaching model is merely deliver the knowledge or ideas through teaching to the mental domain of the students. According to this model the knowledge cannot be provided merely through the expression of since organs, but the known principles of language are most important. Edge of the content is also a necessity. The knowledge cannot be provided merely by speaking the words or listening them. Mental processes and language both work together.
- The Impression model of teaching (John Locke).-It is based on a general assumption the child's brain is like a clean slate at the time of birth. Whatever experiences are provided through teaching, creates impression on child's brain. These impressions are termed as learning. In the learning process the sense organs.
- The Rule model (Kant)-In this model much importance is given to the logic. Kant gives importance to logic, because in it following certain rules is essential. The objective of rule model is to develop the logical reasoning capacities of the student. Some particular rules are followed. Planning, organization and interaction of teaching is performed under specific rules.

2. Psychological model of teaching: John P. Decca had mentioned such types of models. It includes.

- Basic Teaching model (Robert Glaser) - Robert Glaser (1962) has developed a stripped-down teaching model which, with modifications, is the basic teaching model. The basic teaching model divides the teaching process into four components or parts. It will be useful in several ways. The four parts of the model represent the basic divisions. Instructional objectives, Entering behavior, instructional procedure, and finally performance assessment.

- An Interaction model of teaching (N.A. Flander). - Flander considered teaching process as an interaction process. He divided class-room behavior in ten categories known as Flander‟s ten category system. In this model the behavior of student and teacher is analyzed. An interaction between a teacher and the student is more emphasized in this model.
- Computer based teaching model (Daniel Davis)-It is the most complicated model having, entering behavior, determination of objectives and teaching aspect as fundamental elements. In this element computer teaching plan is selected according to the entering behavior and instructional objectives. The performances of the student are evaluated. Accordingly alternative teaching plan is presented. In this model, the diagnosis and teaching go side by side. Remedial teaching is provided on the basis of diagnosis .Individual differences are also given importance

3. Modern teaching models (Joyce and Weil)

Eggen, Kauchar and Harder (1979) have discussed six Information

Processing Models –

- General Inductive Model,
- Concept Attainment Model,
- Taba Model,
- General Deductive Model,
- Ausubel‟s Model and
- Such man‟s Inquiry Model.

4.5 MODERN TEACHING MODELS

The most comprehensive review of teaching models is that of Joyce and Weil (1980).Bruce R.Joyce has divided all the teaching models under the title "Modern teaching models". They identified

23 models which are classified into four basic families based on the nature, distinctive characteristics and effects of the models.

These four families are:

1. information Processing Models
2. Personal Models
3. Social Interaction Models and
4. Behavior Modification Models.

Within the families, there are specific models which are designed to serve particular purposes.

4.5.1 Information Processing Models

The models of this type are concerned with the intellectual development of the individual and help to develop the method of processing information from the environment. These models focus on intellectual capacity. They are concerned with the ability of the learner to observe, organize data, understand information, form concepts, employ verbal and nonverbal symbols and solve problems. The primary purposes are:

1. The mastery of methods of inquiry
2. The mastery of academic concepts and facts
3. The development of general intellectual skills such as the ability to reason and think more logically

The models which belong to this family are:

a. The Concept Attainment Model
b. Inquiry Training Model
c. The Advance Organizer Model
d. Cognitive Growth Development Model
e. Biological Science Inquiry Model

Brief Review of the Information Processing Source Models

SOURCE	TEACHING MODEL	INNOVATOR	AIMS AND APPLICATION
The Information Processing Source	1-Concept Attainment Model 2-Inductive Model	Bruner, Hilda Taba	To develop inductive reasoning, mental inductive process, and understanding of concepts and principles.
	Inquiry Training Model	Richard Suchman	To develop individual competencies to achieve the social objective.
	Biological Science Inquiry Model	Joseph J. Schwab	To develop understanding of research methodology, to think logically on social problems.
	Advance Organizational Model	David Asubel	To understand concepts and facts and to make the content purposeful and interesting.
	Cognitive Growth Developmental Model	Jean Piaget	To develop general intelligence and logic,social and moral development.

Personal Models Personal development models assist the individual in the development of selfhood, they focus on the emotional life an individual. The emphasis of these models is on developing an individual into an integrated, confident and competent personality. They attempt to help students understand themselves and their goals, and to develop the means for educating themselves. Many of the personal models of teaching have been developed by counsellors, therapists and other persons interested in stimulating individual's creativity and self-expression.

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The primary goals are:

- To increase the student's self-worth,
- To help students understand themselves more fully.
- To help students recognize their emotions and become more aware of the way emotions effect other aspects of their behavior,
- To help them develop goals for learning,
- To help students develop plans for increasing their competence,
- To increase the students‟ creativity and playfulness,
- To increase the students‟ openness to new experience.

The models which belong to this family are:

a. Non-Directive Teaching Model,
b. Synectics Teaching Model,
c. Awareness Training Model,
d. Classroom Meeting Model.
e. Conceptual System Model

SOURCE	TEACHING MODEL	INNOVATORS	AIMS AND APPLICATION
The Personal Source	Non-Directive Teaching Model,	Carl Rogers	To develop self learning by auto instructions, self research and self understanding
	Synectics Teaching Model,	William Gordon	To develop creative competencies for problem solving.
	Awareness Training Model,	W.S. Fietz	To develop individual competencies and mutual relations.
	Classroom Meeting Model.	William Glasser	To develop skills of self – understanding and capacities of dutifulness.
	Conceptual System Model	David. F. Hunt	To adjust with the environment with flexibility in the personality.

4.5.3 Social Interaction Models

The models in this family emphasize the relationships of the individual to the society or other persons. The core objective is to help students learn to work together. To identify and solve problems, either academic or social in nature.

The primary goals are:

To help students work together to identify and solve problems

- To develop skills to human relations, and
- To become aware of personal and social values.

The models which belong to this family are:

a. Group Investigation Model,
b. Role Playing Model,
c. Jurisprudential Inquiry Model,
d. Laboratory Training Model,
e. Social Simulation Model,
f. Social Inquiry Model.

Brief review of The Social Interaction Source Models

SOURCE	TEACHING MODEL	INNOVATOR	AIMS AND APPLICATION
The Social Interaction Source	Group Investigation Model	John Dewey, Herbert	To develop democratic abilities, use of knowledge and skills in life of individual and society.
	Jurisprudential Model	Donald Oliver, James P. Shaver	To solve problems on the basis of information and reasoning power.
	Social Inquiry Model Social Simulation Model, Role Playing Model.	Benjamin Cox, Byron	To develop competencies of problem solving and adjustment
	Laboratory Method Model	Bethal, Maine	To develop group skills individual capacities and adjustment.

4.5.4 Behavior Modification Model

All the models in this family share a common theoretical base, a body of knowledge which referred to as behavior theory. The common thrust of these models is the emphasis on changing the visible behavior of the learner.

The models which belong to this family is Operant Conditioning Model

Brief Review of the Behavior Modification Source Model

SOURCE	TEACHING MODEL	INNOVATORS	AIMS AND APPLICATION
Behaviour Modification Source	Operant Conditioning Model	B.F.Skinner	To achieve the objectives of lower level of cognitive domain on the basis of individual differances

A number of instructional strategies to realize different instructional goals have been developed recently by different researchers They have transformed existing knowledge in the learning and teaching processes into „Models of Teaching‟ which can be used by teachers in the teaching, learning process for realizing different instructional objectives. There is a need to incorporate a few „Models of Teaching‟ in the curriculum of teacher education programmer at the secondary as well as elementary level so that prospective teachers attain a higher degree of „ability to teach‟.

4.5.5 The Common Models and Methods of Instruction Teachers Use

Teachers have limitless possibilities when it comes to the methods of instruction that they can use but most of the time they merely use the traditional methods of teaching. Arguably the most widely used models of instruction are Instructor Based models. These teaching methods focus on the teacher and more often than not it involves the teacher thoroughly explaining the subject matter with little to no student interaction. This may be the most straightforward method but its efficiency is reduced due to the short attention span some students have. Since teachers don't interact with their students when they are using Instructor Based teaching models, most students lose their focus and their mind tends to wander.

The progression of education and education technology should follow the progression of time. This calls for new innovative teaching models that cater specially to the students of today. Of course it is not wise to throw away all of the models that the past teachers have painstakingly created. These commonly used models are popular for a reason and that reason is that they were once incredibly successful. This is why it is recommended to use these models as a basis for the new ones. If there is a way to transfer the advantages of these teaching methods to the new concepts then the teachers should do everything in their power to merge the past and the present into one innovative teaching method.

Even though schools should aim for the quick advancement of education and education technology, it is not wise to rush the process. The traditional methods of teaching may have some disadvantages but they are definitely better than half-baked and over-ambitious teaching concepts. Proper research should be put into these new methods because a small piece of information can decide the success and failure of the new innovations. It is important to give these new concepts enough testing time to make sure that they are upgrades and not regressed versions of the traditional teaching methods. Only when these new concepts are properly tested and approved by the Department of Education should the instructors start using them.

Creating social teaching models is a good idea but it is not wise totally break the barrier between teacher and student. Having a teaching model that can promote social activities between a student and a teacher can be for the greater good of education and education technology but limits have to be put on these concepts. Teachers should avoid extremes when it comes to creating new teaching models because of the disastrous result an over-ambitious teaching method can have. Striking the right balance between the traditional teaching methods and these new social teaching methods is what most teachers should aim for. If they succeed at getting the right balance then their chances of success significantly increases.

High tech tools can also be used in the advancement of education technology. Using tools like software programs in the teaching methods of instructors can help instructors attract and keep the attention of their students. However, if the computers aren't regulated then the students can get distracted by the very tools that were made to prevent them from being distracted. Using technology in teaching can be a double edged sword because of the tendency of modern technology to be inclined on leisure instead of work. This is why proper research and testing should be done before deciding on the usage of these items. If the technology is utilized properly then there is a huge probability that it can yield great results.

4.6 PROBLEM-BASED LEARNING (PBL)

In many ways problem based learning (PBL) is the same as inquiry: A problem situation is posed to students who then set up the means to investigate, gather evidence, problem solve and present solutions. Indeed, some PBL scenarios can be so complex that an entire unit is driven by a single problem that invites multiple aspects of inquiry and problem-solving. But more likely it will be a subset of a unit – perhaps a series of lessons over several days, or maybe just a single activity. The essential thing is that students are placed in the active role of solving a complex, real-world problem that has no simple, pre-determined "right" solution. It requires information-gathering and either drawing upon knowledge and skills already acquired or getting the knowledge and skills they need. You pose the problem and you facilitate the process by asking questions, challenging your students' thinking, keeping them involved, scaffolding and managing group dynamics. Your students solve the problem by active participation in breaking down the problem and making decisions that ultimately help them make meaning out of the whole thing.

4.6.1 Why use Problem-Based Learning?

Well thought-out problems provide students with real-life dilemmas set in authentic contexts. At the very least this will stimulate interest and motivate students to find solutions to the problem, which in turn sets the inquiry process in motion. They become actively engaged, start asking questions, and gathering information to get answers. As they draw upon what they already know they strengthen existing content knowledge but also invite new knowledge by figuring out what they need to know to come up with a solution. It also promotes higher order and creative thinking and sharpens problem-solving and inquiry strategies because of the multiple factors they must address, manipulate and reflect upon throughout the process. PBL also gives students a sense of relevance – or put another way, helps answer the question "what does this have to do with the real world?"

4.6.2 Problem-based Learning in Practice

No amount of words can replace the value of actually seeing PBL in action, so take some time to view the video clips before actually planning and implementing the model yourself. As you view the videos here are some questions to consider:

1. How are students oriented to the problem?
2. What organization and ground rules does the teacher establish?
3. How does the teacher facilitate and assist the problem-solving/ inquiry process?
4. What end products do students ultimately come up with and what do they do with them?
5. How do students make sense of what they learned when it is all over?

Planning PBL Using GRASPS

Grant Wiggins and Jay McTighe (2001) introduced the acronym of GRASPS for constructing assessment performance tasks, but it works equally well for planning PBL scenarios.

		Examples
G	**Goal:** A goal, challenge or obstacle for the problem scenario is posed.	• The problem/challenge is to … • Your task is to … • The goal is to … • The obstacles to overcome are …
R	**Role:** The role the students play in the problem scenario should be defined and clarified.	• You are a(n) (actor, candidate, detective, engineer, eye witness, inventor, jury, nutritionist, park ranger, pilot, reporter, scientist, tour guide, tutor) … • You have been asked to … • Your job is to …
A	**Audience:** Identify the *audience* that the problem solution is intended for.	• Your client(s) is (are) … • The target audience is … • You need to convince … • (board members, community members, government officials, television viewers, a jury)

S	**Situation:** This involves setting and explaining the context for the problem *Scenario*.	• The context of the situation you are in is … • The challenge involves dealing with … • The need/requirement is … • The environmental conditions are …
P	**Product:** Clarify what *products* or *presentations* students will create to demonstrate solutions to the problem.	• You will create a(n) … • You need to develop … so that … • (advertisement, article, brochure, data display, demonstration, diagram, drawing, exhibit, graphic, newscast, poster, PowerPoint, story, web sit …)
S	**Standards:** State standards to evaluate and guide students' problem-solving, decision-making, and solutions.	• Your product needs to … • Your work will be judged by … • A successful result will … • (accurate, appropriate, convincing, defensible, justified, organized, persuasive, reflective, supported, understandable, unique, verified …)

PBL Scenarios

If you use GRASPS and the same five questions you used above to observe PBL lessons, you will experience success. Let's try a couple.

Notice that all the elements of GRASPS are present in this scenario, so with some careful planning on your part you should be able to find the right place in your unit to orient your students to the problem scenario. The key to effective planning is knowing what you are trying to accomplish and placing your PBL activity in the right place at the right time. For example, your students are going to have to know something about thrust, lift, drag and gravity to solve the problem. But is this going to be a PBL activity at the end of the unit so what you are really doing is assessing what they should have learned, or is it going to be earlier so through a more open inquiry they find out what these forces are all about? Your approach to how you will facilitate and assist the problem-solving and inquiry process will differ greatly depending upon this timing aspect. Your end products will likely be different as well, depending upon when you introduce the PBL activity. You also need to help students make sense of what they have learned through reflection, discussion, and other strategies. But once again, exactly how you do this will be dictated in part by the timing of the PBL in your unit. So it's up to you. One approach is not necessarily better than another – you just need to know what you are trying to accomplish. The second scenario illustrates that problems can be socially relevant, real world situations that need genuine solutions. Furthermore, such a problem underscores the realization that science doesn't work in isolation from the rest of the world. Problem-based learning is an ideal candidate for interdisciplinary studies – it's not a stretch to see that this scenario could open the door to a study of politics, economics, and geography, culture, history and language arts.

Structurally, the scenario still conforms to GRASPS, but shows you that you that the approach should be adjusted to fit the specifics of your problem scenario. It is also important to understand that if you want a complex problem such as the Katrina aftermath to be a successful learning experience, you need to think through what supplementary materials are needed. Besides identifying necessary conceptual understandings of the ecology and chemistry of water you could gather articles, photographs, video clips, interviews, and/or a number of other resources to help inform and intrigue your stories and drive home the relevancy of such an event.

4.7 CLASSROOM DISCOURSE

Think of classroom discourse as an enhanced form of everyday class discussions that is characterized by explicit attention to improving conceptual understanding, thinking processes, creativity, communication and social skills. The benefit of treating this as an actual model of instruction is it draws our attention to what makes good discussions. Let's face it, too many discussions end up as one-way delivery systems because the teacher figured it is just a normal part of everyday instruction and neglected to plan what it takes to draw students in and keep them there.

Classroom discourse as a model encourages you to plan and teach full classroom discourse lessons. As you do so, and as you reflect on what worked and didn't work, you will by natural extension begin applying your enhanced skills to everyday class discussions as well.

Why Use Classroom discourse?

Learning comes from experiencing the information, not the information itself. Discussion accomplishes this by encouraging students to manipulate, extend and express their own ideas, and to listen to what others have to say. Good classroom discourse teaches the inquiry process – in fact, it replicates every phase of the 5Es.

Classroom discourse engages students with intriguing questions or ideas, and keeps them engaged as they think about and contribute to the ideas expressed. This naturally propels students into the explore phase as they dig deeper and take responsibility for their thinking about the content. This raises more questions and invites explanations that lead to new understandings, and it extends thinking by giving students opportunities to take their ideas down paths hitherto uncharted. And because students are expressing their ideas it provides an ongoing evaluation of conceptual understanding, misconceptions, communication, and thinking skills.

Finally, let's not overlook the personal and social skills classroom discourse builds. Students learn to analyze their own thinking processes and develop communication skills to get their ideas across. They also learn to listen to and respond to others' ideas and to ask the right questions.

Classroom discourse in Practice

View the video clips of the classroom discourse lessons. As you do so, consider these questions:

1. How does the teacher introduce the discussion and draw the students into the conversation?
2. In what ways does the teacher keep the flow of discussion going?
3. What do you notice about the nature of questioning, responses, wait time, paraphrasing, summarizing, and so on used by the teacher?

4. How does the teacher summarize the discussion?
5. How has the discourse supported understanding, communication, and thinking processes?

Planning Classroom discourse Lessons

The first step to successful classroom discourse lessons is to recognize that you need to plan and prepare just like you would with any other lesson model. Rich discussions seldom occur without a plan. If you try to wing it so will your students. Fortunately, your plan doesn't have to be elaborate. Just remember these six conditions:

1. Purpose. Know the purpose of your lesson and match the right kind of discussion to fit that purpose. The three main kinds of discourse discussions are:

- Recitation: used to both find out what your students know about the topic and to build upon what they know to carry the understanding further. Recitations are teacher-directed: you ask q question—students respond – you react.
- Guided Discussion – a process that builds student understanding by guiding students through relevant inquiry considerations. For example, a discussion to explore a misconception might ask students to compare, interpret, and infer the information before them, then to explain what they think that means. Though less structured than recitation, guided discussions are still largely teacher-directed. Provocative questions and effective "wait-time" help promote an environment for student thinking and independence.
- Open-ended Discourse – this approach encourages students to take responsibility for their thoughts and understandings with as little teacher intervention as possible. You are not trying to lead your students to predetermined conclusions; rather, you are helping them to extend their understanding through logical inquiry

applications. You do this through divergent questioning and follow-up statements that seek clarification and/or elaboration. Thinking is creative and higher order process skills such as predicting and hypothesizing are encouraged. The discussion may lead to student-devised investigations, problem-solving, and evidence-driven decision-making.

2. **Space.** "… if we put before the mind's eye the ordinary schoolroom, with its rows of ugly desks placed in geometrical order, crowded together so that there shall be as little moving room as possible ...and add a table, some chairs, the bare walls, and possibly a few pictures, we can reconstruct the only educational activity that can possibly go on in such a place. It is all made 'for listening.'" John Dewey made that statement in 1899, but it still depicts today's typical classroom. You can rearrange desks or chairs into a circle or semi-circle in a couple minutes. The difference can be students engaged in genuine discourse with one another versus a student to teacher answer session.

3. **Invite.** Like any good lesson, you need something to draw students in – a hook – be it an interesting statement, a discrepant event, or the right kind of leading question. Your job is to invite students into the discourse by coming up with this hook, then have at your disposal a cache of questions and statements to hold them and move them forward. The typical question-answer pattern prevalent in most classrooms doesn't cut it. This scene from Ferris Bueller's Day Off is a great comedy scene but only because it parodies real classroom life so well.

The remedy is summarized by Vygotsky: "Before you want to involve the child in some kind of activity, interest the child in it, being concerned to make sure that the child is ready for this activity, that all the child's strengths needed for it are exerted, that the child will act for him/herself, and that for the teacher remains only the task of guiding and directing the child's activity."

4. **Flow.** Once you've successfully invited your students into the discourse process you need to exercise a number of strategies to keep them there and to manage the flow of the discussions. Central to these strategies will be questions – questions that provoke, invite, and make students think. The primary strategies are:

- Prepare questions and possible follow-up questions ahead of time. Don't expect good questions to pop up spontaneously, no matter how well you understand the content.
- Use "wait time" after asking a question. It takes practice to wait five seconds, but this is what students need to process the question and formulate a response. Don't be Ferris Bueller's teacher by answering your own questions.
- Reduce the "startle" effect by asking the entire class the question first, then say the student's name and repeat the question. Some students forget the question when they suddenly hear their name and all eyes turn to them.
- Be prepared for the dominant talkers (e.g., ask for raised hands, use a talking stick) and the reticent talkers (e.g., use small groups and have them take turns to "report out").
- Slow down and probe. Rather than moving on after an initial short answer, let another student comment, then come back and ask the first student if that has altered the original answer. Encourage elaboration. And remember that you are there to facilitate the students' discussion, not to be the main voice.
- Refocus the discussion when it starts getting too far off track.
- Summarize points before moving on, but not until students have had opportunities to comment first. This does not mean re-answering the question. Let your students take responsibility for the accuracy and clarity of their statements and don't send the signal that only you have the real right answer.

- Don't interrupt and don't let other students interrupt.
- Pay attention to body language and nonverbal signals, including your own signals of approval, disapproval, interest, or impatience.

5. **Variety.** Varying your question types helps keep the discussion alive. Though you are unlikely to use all seven types of questions in a single session, use more than one type.

Those question types are:

- Attention-focusing Questions -- To help students focus on observations and other details and make connections;
- Measuring and counting questions – To help students develop confidence because the questions can be answered directly from the experiences of the activity;
- Comparison questions – To help students focus their observations and to classify, categorize and/or order objects or results.
- Action questions – Help students explore new materials, properties, forces, and/or events. Can be answered through simple investigations
- Problem-posing questions – Engage students in realistic problem-solving situations, encourage experimentation and promote critical thinking
- Reasoning Questions – Stimulate students reasoning and help them to draw conclusions and generalizations, leading to expanding or changing their ideas. These questions should not be asked until students have sufficient experience to reason from evidence.
- Metacognitive Questions – These questions help students think about the own thinking processes

6. **Close.** Draw your discussions to a meaningful close. This means summarizing the main ideas, relating the discussion points to your unit's big ideas, and/or prompting your students to summarize what they got from the discussion. We've all been part of discussion

which seemed to be going somewhere but then left us hanging. That's because the facilitator failed to close the discussion and bring it to the next level. Think back to why you initiated this discussion in the first place. Was it to get your students to think about additional evidence? To face their naïve conceptions? To recognize alternate viewpoints? To evaluate each other's conclusions? Whatever your initial purpose, bring it back into the close and let your students see it through the lens of their own thinking and ideas. This is how your transform a typical classroom discourse into an inquiry-based learning experience.

4.8 COOPERATIVE LEARNING

Simply defined, cooperative learning is students working together in small groups, learning through interaction with each other while the teacher coaches the process. The broad goal is to teach collaboration skills so that the inquiry process can unfold. Successful cooperative learning comes about by thoughtful foresight on your part as to the tasks of each group and each individual within that group. The notion that you can simply tell your students to get into small groups to "work on the problem" isn't cooperative learning, as any teacher who has tried this hit-or-miss approach will tell you.

Collaboration is a skill, and like any skill it needs to be taught and you need certain tools (such as tasks, roles, communication and reflection) to carry it out. You are the task-master, or at least the task-setter, and each student has a well-defined role that clearly identifies what is expected of that role. As small groups work on their tasks you rove and coach the process, encouraging students to participate and communicate with one another. You provide ongoing feedback and evaluation, and ask the students to do the same, leading to meaningful reflection and understanding.

4.8.1 Why Use Cooperative Learning?

Cooperative learning is perhaps the most efficient and effective mechanism to attain the goals of inquiry. Cooperative learning provides focused and supportive structures for inquiries to occur while interacting with students; gets students talking with one another about scientific ideas; challenges students to accept and share responsibility for their own learning; responds to student diversity and encourages all students to participate fully in science learning; and encourages and models the skills of scientific inquiry, as well as the curiosity, openness to new ideas and data, and skepticism that characterize science.

Ample research on cooperative learning points to a strong potential for students to: (a) successfully integrate information, (b) improve ability to respond critically, (c) develop more authentic views of the nature of concepts, (d) improve skills in creative thinking, (e) improve attitudes and motivation, (f) develop greater interest in learning, (g) enhance social and interpersonal skills such as building lasting friendships with individuals from diverse backgrounds, and (h) attain high levels of self-efficacy.

Cooperative Learning in Practice

Ponder the following questions as you view the cooperative learning video clips.

1. Describe the nature of the cooperative structure the teacher sets up. In what ways does this seem to support the lesson's goals?
2. How does the teacher organize group tasks and individual roles? Does it work? Why or why not?
3. Describe the teacher's facilitation of the overall process as well as specific scaffolding strategies to support the learning experiences.
4. How well did the groups work together? Did they display a quality of "we're all in this together" or "I'll do it by myself"? How did the teacher address this?

5. Did they learn anything? How do you know?

Planning Effective Cooperative Learning

In general, cooperative learning demands specific attention to managing logistics, guarding the learning environment, coaching, establishing accessible relationships with students, recognizing differences, and stimulating authentic learning experiences. By the same token, once you've attended to these details and oriented your students to them, the learning environment becomes more productive and manageable. There are five overarching principles to successful cooperative learning.

4.8.2 Concept Teaching

If you think about it, you are teaching concepts no matter what approach you use. So what is a concept? It depends upon who you ask. Here are just a few examples you'll find on the web. Big ideas are concepts – they encompass the common elements in all of these definitions, which is why the big idea approach to planning and instruction is emphasized in this textbook. Without an organizing principle like big ideas you could easily get bogged down in a sea of concepts – for how would you decide which ones to teach? Content standards or curriculum frameworks often contribute to this sea of concepts sensation. While they may justifiably identify every concept students should learn, attempting to teach all of these standards results in broad coverage but not learning and understanding.

Why Use Concept Teaching?

Conceptual understanding is the antidote to wrong science. We need to use every means at our disposal to help our students acquire the conceptual knowledge to become scientifically literate. Even when using indirect means as might be found in open-inquiry, our ultimate goal is to teach concepts. But indirect means are not practical for teaching all concepts – oft-times the best approach is the most direct approach. Whether deductive (naming and defining the concept first, then encountering examples and no examples) or inductive (encountering examples and no examples before arriving at the concept), concept teaching explicitly teaches concepts and nurtures logical reasoning and critical thinking. The other thing about concept teaching is that even though the exact approach differs according to the nature of the concept, there are still structural characteristics that help us define what should be included.

Concept Teaching in Practice

As you view the video clips of concept teaching, keep these questions in mind

1. How does the teacher set the stage and conditions for learning this concept?
2. What strategies did the teacher use to present examples and nonexamples, and do you think the students grasped these? Were the examples and nonexamples sufficient?
3. Describe the various techniques used to draw attention to critical and noncritical attributes. Did this engage the students, stimulate their thinking and encourage them to assess the consequences of their choices?
4. When the concept was defined, did the students "buy" it? Why or why not?
5. What were the most effective approaches to help the students grasp the concept and big ideas? Least effective? What else could have been done?

Planning Effective Direct Instruction

Strictly speaking, direct instruction proceeds through five tightly structured steps of advance organization, demonstration or presentation, guided practice and monitoring, debrief/closure, and independent practice. As you look at these five steps in more depth, keep in mind that even though highly structured, they can and should still be augmented with effective inquiry strategies such as questioning, predicting, and problem-solving.

Step 1: Advance Organizers

The advance organizer provides a preview of information to be learned. The premise is that meaningful learning results when the student is able to connect new knowledge with existing schema. You might think of it as a special case of Engage. You still need to grab your student's attention, but you do it by presenting a structured overview of what is to be taught and connected it to what they already know. This might be done with an outline, a graphic organizer, or orally.

The point is that you have taken this new information and made it more familiar, then you are ready to move on.

Step 2: Demonstration/Presentation

Demonstrations are essential components in every phase of science inquiry and can be found in virtually any model of instruction. You use demonstrations to: grab attention (discrepant events), invite questions, model proper skills or procedures, focus attention on specific challenges, help solve problems, model safety, avoid putting students in danger, support slow learners and challenge advanced learners. Students are learning by observation rather than doing, which requires some specific strategies to be successful.

Attention: Students can only learn if they pay attention to what's going on. Hopefully your advance organizer has drawn them in, but the demonstration itself needs to hold their attention. Build in ways for students to identify with the demo, build up their expectations, arouse their emotions.

Retention: Your students need to retain what it is they just observed so it can be recalled later and used. You increase opportunities for retention by involving students in the demonstration when feasible, repeating certain steps to focus attention, keeping the demo visible, using simple and familiar materials, and minimizing the steps.

Reproduction: If you expect your our students to repeat the demonstration or to grasp the principles, they need to be capable of reproducing the demonstration. Just think about observing the assembly of a car engine. Don't try it on your own. On the other hand, you could probably reproduce the steps of using new features in the car you just purchased provided you carefully observed a demonstration of these features.

Motivation: Give your students a reason to learn from the observed demonstration. In the case of learning how to use the gadgets on your fancy new car you may have all the motivation you need, but don't expect your students to be equally motivated to learn how to measure light levels with your fancy light meter. Sometimes that reason is good old reinforcement or punishment. "After you do your light measurements, we can watch our movie."

Presentation is the predominant instructional delivery system used by K-12 teachers and university professors alike. After all, there is so much material to cover and so little time to do it in. But if you think about that presentation in your college class which laid out more information in fifty minutes than existed in the first millennium of human existence, you realize the potential danger of the presentation method. And now we have sophisticated presentation tools like PowerPoint – double edged swords that make it easier to put together effective presentations but also increase the risk of overcoverage. So once you have identified the information to be presented and organized it at least so it makes sense to you, how do you present information so it will sink in? Three tips will help you turn that presentation into something you and your students will enjoy.

Use Visuals. Visual aids such as pictures, graphs, tables and props increase the chances of meeting your lesson objectives. So once you have assembled and organized the new information to be presented, toss out the bullet points and replace whatever you can with visuals.

Rehearse. A presentation may not be a speech to be memorized but it is a delivery of information that needs to be engaging and comprehensible. Hemmingway said “the first draft of anything is shit” and this applies as much to your presentation as it does to a manuscript. Though you are well on your way once you have all your points together and have eliminated unnecessary details and come up with great visual aids, you are not done until you iron out the kinks. You do this through rehearsal.

Less is More. Cognitive science teaches us that children’s working memory can hold four chunks of information for a short period of time, but even then we need to build in memory-retrieval strategies to help students access and use that information later (Cowan, 2005). Practically speaking these means the “rule of 3” for presentation makes sense. Beginning-middle-end -- that’s good, as long as your presentation structure doesn’t have a fourth part you’re set there. If you have over four main points for any of these parts, get rid of one. Then just make sure none of your main points have no more than three sub-points.

Step 3: Guided Practice and Monitoring

This step affords students opportunities to practice and demonstrate their understanding of the material, and for you to monitor the level of mastery. If you had demonstrated the concept of pitch by plucking a string as you shortened the length, then guided practice might involve students trying this out on their own while you assist them in accurately measuring the lengths and entering the results in a data table.

Or if you had introduced the concept of static electricity by presenting the interrelationship of attraction, repulsion and friction, guided practice might include rubbing materials (friction) and recording the effects of attraction and repulsion. Again, the guided practice is tightly structured since your objective is to assure that students understand the concepts correctly before moving on.

They are:

- Identifying similarities and differences (comparing, classifying, metaphors, analogies)
- Summarizing and note taking.
- Reinforcing effort and providing recognition.
- Nonlinguistic representations (graphic organizers).
- Generating and testing hypotheses (systems analysis, problem solving, decision making, investigation, inquiry, invention).
- Questions and cues.

Step 4: Debrief and Closure

As with debriefing in any of the instructional models, students are guided through a process that helps them make sense of what was taught, though the approach is more structured as you look for specific evidence to ascertain that the lesson objectives have been met. Whereas some debriefing sessions in student-directed models might lead down uncertain roads, you know what you're looking for in direct instruction and your job is to make sure students get there. In terms of the 5Es this is where you Extend and Evaluate student understanding. Your strategies can be drawn from the same six strategies outlined for guided practice, though the way you use them concentrates on extending understanding, not just reinforcing presented material.

Step 5: Independent Practice

Students need considerable practice to master a skill or to deepen their understanding of content. In fact, Marzano, Pickering, and Pollack (2001) also highlight practice as one of the research-based categories of Classroom Instruction that Works. Their research indicates that students need 20 or more practice sessions before the content or skill can effectively be used on their own. Thus it behooves you to build independent practice into whatever you teach. The following five approaches are particularly effective.

- Assign homework. When students are given the purpose of a homework assignment and the expectations are clear, it works. Thus, homework tied to content or skills acquired in class stands a good chance of doing what you expect it to do – reinforcement through practice.
- Select just the most important content and skills to practice
- Schedule massed practice (sessions close together) and distributed practice (sessions spaced apart).
- Have students chart speed and accuracy.
- Help students shape their new skill or process.

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CHAPTER 5

TEACHING-LEARNING AIDS

INTRODUCTION

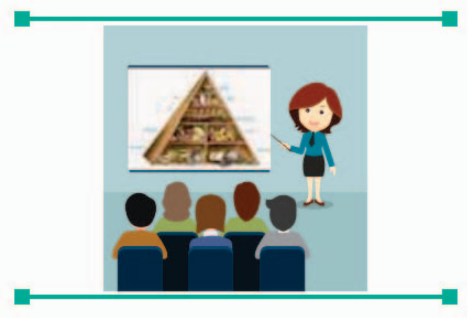
A Teaching Aid is an instructional aid (book, chalk board, picture), an object (such as a globe, or map or a specimen) or device (such as a DVD or computer) used by a teacher to enhance or enliven classroom instruction. Teaching Aids are instructional materials and devices that help the teacher in carrying out teaching learning process. According to The Random House Dictionary (2017) 'Teaching Aid is the material used by a teacher to supplement classroom instruction or to stimulate the interest of students'. Teaching aids are aids available to the teacher. They cannot replace the teacher by any means.

Making the learning process effortless as well as pleasurable is a difficult task. A lot depends on the creative and innovative abilities of the teacher /facilitator. Use of teaching aids with adult learners can facilitate the learning process by making it interesting and less time consuming. For instance, if on a particular day, the importance of clean water has to be taken up in the class then instead of just giving a lecture on the topic, the whole issue can be discussed using a picture book or a cartoon book or even by showing a film. This method is likely to be more effective and evoke lively responses from the learners. If the learners are further asked to illustrate or draw out the sources of clean drinking water, or even demonstrate ways of keeping water clean and safe, or the health hazards that can arise by the use of unclean water – this would further go on to reinforce the concept. The use of teaching aids enables learners to not only use their hearing or seeing abilities but to actively perform something as well while learning.

5.1 TEACHING AIDS

A teaching aid is a tool used by teachers, facilitators or tutors to help learners improve reading and other skills, illustrate or reinforce a skill, fact, or idea and relieve anxiety, fears, or boredom since many teaching aids are like games.

Definition of teaching aid are the aids used by the facilitator to help him/her in facilitating his/her lesson effectively.



5.1.1 The Importance of Teaching Aids

Teaching aids play an important part in the teaching-learning process. It presents information in a new and helpful manner so that students get a better understanding of what they are taught. In addition to this, using different kinds of teaching aids in the classroom help teachers to reach the different kinds of learners in the classroom.

Let us look at how teaching aids help students:

- Novelty - Students love new things and innovation in the classroom, teaching aids help to break the boring routines and add a healthy life to the classes.
- Retain the information longer-The effective use of teaching aids will help students to better retain what they have been taught.
- Better understanding- Teaching aids help to convey concepts in a better manner and this way, the learners would comprehend the lessons well.
- Better learning experience- teaching aids generally helps to break down the monotony in the classroom and makes classes more happening and interesting.
- Increases conceptual thinking- with examples and the environment that teaching aids create, it is perfect for conceptual thinking and helps students to expand their horizons.

5.1.2 Characteristics of Good Teaching Aids

- They should be meaningful and purposeful
- They should be accurate in every aspect
- They should be simple
- They should be cheap
- They should be improvised as for as possible
- They should be large enough to be properly seen by the students for whom they are meant
- They should be up-to-date
- They should be easily portable

- They should be according to the mental level of the students.
- They should motivate they learners

5.1.3 Need of Teaching Aids for the Learners

1. Teaching aids elicit the learners' attention, create an urge to learn and sustain their interest in learning.
2. Teaching Aids make teaching learning process interesting.
3. Its use facilitates learning.
4. Use of Teaching Aids brings affectivity in learning.
5. Their use enriches the teaching learning process by bringing variety, diversity and newness in it.
6. Teaching aids keeps the learners driven and motivated to learn.
7. Teaching aids concretize learning experiences for the learners. They enable them to understand the most difficult and abstract concepts.
8. They provide direct purposeful experiences to the learners.
9. Learners have a tendency to forget. If used properly teaching aids can help retain concepts permanently.
10. Teaching aids can reinforce learning.
11. Teaching Aids can reach the learners irrespective of their level of literacy and language.
12. The teaching aids when used in groups, helps promote increased group interaction.

5.1.4 Need of Teaching Aids for the Teacher/Facilitator

1. Use of Teaching Aids helps teachers/facilitators create a lively and interesting teaching- learning environment.

2. By their use teachers can break the monotony in teaching caused by the rampant use of verbalism (Lecture method).
3. Their use leads to an interactive learning environment and hence brings affectivity in teaching.
4. Helps teacher use innovative materials and methods to clarify concepts and hence become more effective and efficient teachers
5. It enables the facilitators to determine learners pace of learning.
6. Their use helps in monitoring the progress of the learners.
7. They help minimize the efforts of teachers and facilitators too in the process of teaching
8. Save time and energy expended both by the teachers in transacting concepts and learners in understanding them.
9. By use of Teaching Aids the teachers can cater to the needs of diverse groups of learners, diverse learning styles by use of variety of materials, aids and devices intertwined in the teaching- learning process.
10. Help the facilitators in the skilful achievement of teaching objectives and goals.
11. Can help the teachers/facilitators in spread of awareness and education on a mass scale.

5.2 TYPES OF TEACHING AIDS

After having grasped the concepts and need of Teaching Aids, we will now examine their various types. Teaching Aids can be broadly classified as follows:

I. On the Basis of Time-period of use of Teaching Aids

1. Conventional or Traditional Teaching Aids
2. Non-conventional and Modern Teaching Aids

Traditionally when technology had not yet appeared in the form as it is available today there was no electricity, no computers or internet and even telephones. The teacher made use of chalk and blackboard as a standard teaching aid. Another popular teaching aid was the 'dust and mud sketching' used rampantly by the teacher. Even the elements of nature, actual objects and specimens presented themselves as teaching aids. Everything was written. Books formed the traditional or conventional resource available to both the teachers and learners.

With the gradual technological progress, modern and non-conventional teaching aids and resources became available to both the teachers and students like Computers, Personal computers, Laptops, Interactive Whiteboard, LCD projector, Television, Tablets, Android phones, accessories like U.S.B cable, etc. The modern teaching aids present themselves in a variety of forms and utility. A world of opportunities like teaching aids, games, activities and media are available to the students today. They have made the teachers/facilitators task both enjoyable as well as challenging. The use of Nonconventional or modern teaching aids plays an important role in the teaching learning process today.

II. On the Basis of the Sense Organs Involved: Teaching Aids re also called as Audio- Visual Aid. Traditionally used teaching aids stimulated only one sense organ that is either the eyes or ears. However the contemporary teaching aids provide stimulation to ears and eyes together. The emerging teaching aids involve other sense organs too.

A. Audio-aids: Audio-aids help in developing the listening skill of a learner. Audio-aids are those aids which can be only listened. Examples, of such types of aids include, radio, gramophone, tape recorder, audio-tapes, walkman and headphones etc.,

B. Visual-aids: Aids which require the involvement of learners visual senses are called visual aids. Examples, of such types of aids include viz. graphic aids, 3d-aids, display boards and print material etc.,

C. Audio-Visual Aids: In these aids both the listening (ears) and viewing faculties (eyes) are involved. Such aids include television programs, video films, motion pictures, synchronized audio slide projectors, computers and computer-assisted instructions etc.,

D. Emergent Aids

III. Projected and Non-Projected Aids

A. Projected: Projected Aids include Power point presentations, slides, film-strips, filmstrip projector, films, transparencies, overhead projector, TV/VCR as they can be projected on screen or even against white-washed wall to give an enlarged image of the material. They can be used suitably for both large groups as well as small groups. The large, bright and colorful larger than life images make them more effective than a non-projected aid.

B. Non-Projected: Those aids which do not require projector electricity or projection screen. Such materials can be simple shown, can be hung or touched e.g: Chalkboard, Whiteboard, Flannel board, Magnet board, Charts, Posters, Pictorial Materials, and Models etc. They can hence be used with good results. They provide first hand experiences and also make the learners actively participate. They add an interest and involvement of the learner and ensure better results and longer retention.

IV. On the Basis of the Experience Provided by an Aid: Dr. Edgar Dale has classified and arranged audio-visual aids in a proctorial form called "Cone of Experience"

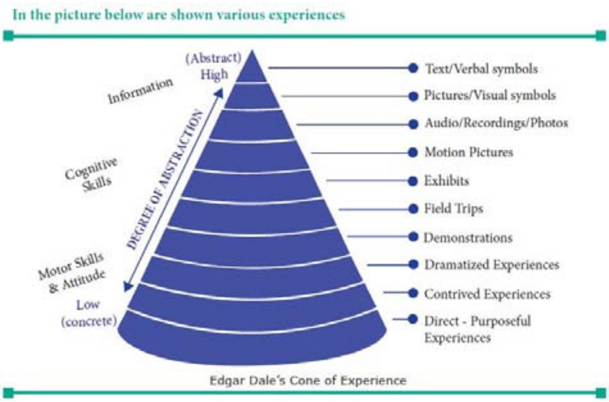
The primary source of contact between the individual and external world and any intellectual activity depends on experiences coming through senses. Even mental activities such as concentration, reflection, conception, imagination, association, recollection etc., have their basis in sensory experiences. Mind like stomach, works on what it is fed. This feeding comes through senses. The raw material for mental activity is provide by

(i) Direct Experiences: Such experiences are gained by the pupils through excursions and trips etc.,

(ii) Representative Experiences: This type of experiences are less concrete but are quite useful. This type of experiences are provided by models, specimens, film strips, radio etc.,

(iii) Verbal and Symbolic Experiences: Such experiences are those which the pupils gain through word-oral or written. This type of experiences are very abstract and occur at conceptual level. E.g. verbal illustrations. This type of experience cannot be properly followed at the initial stages of child-learning so at initial stage more emphasis be laid on direct and representative experiences.

The theory of audio-visual instruction needs that education must make learning permanent and experiences usable. The advocacy for the use of new material for improving instructions is based on the fact that the verbalistic learning is out of date and the complexity of the time has made our school curriculum very much heavy as the present day knowledge has developed tremendously. We need new ways to adjust ourselves to the changed circumstances and the trends towards realistic learning.



The above cone represents the material used for audio-visual instructions.

5.3 THE CONE OF EXPERIENCE

The Cone is a visual model, a pictorial device that presents bands of experience arranged according to degree of abstraction and not degree of difficulty. The farther you go from the bottom of the cone, the more abstraction the experience becomes.

5.3.1 Direct Purposeful Movement

First-hand experience which serves as a foundation of our learning. We build up our reservoir of meaningful information and ideas through seeing, hearing, touching, tasting and smelling.

Examples of Direct Purposeful Activities

- Preparing meals or snacks.
- Making a piece of furniture

- Performing a laboratory experiment

- Delivering a speech

- Taking a trip

Why are these direct experiences described to be purposeful?

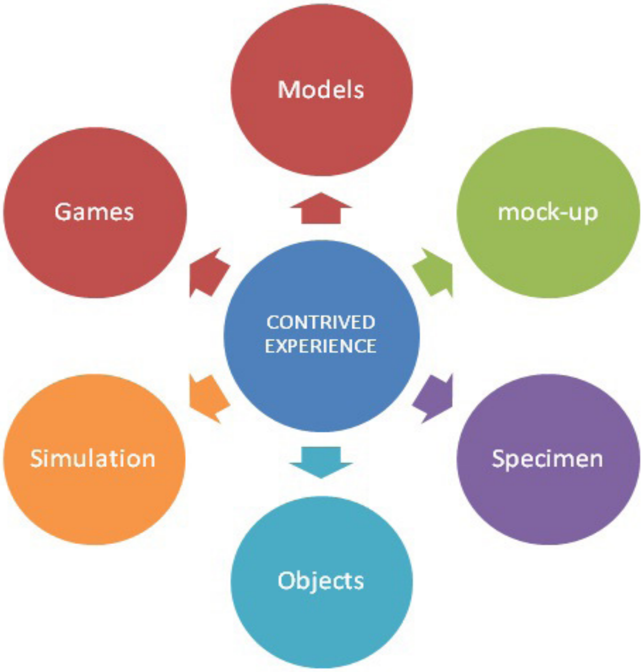
- They are experiences that are internalized in the sense that experiences involve the asking of questions that have significance in the life of the person undergoing the direct experiences.
- These experiences are undergone in relation to a purpose, i.e. learning
- It is done in relation to a certain learning objective.

What does Direct Purposeful Experience imply to the Teaching-Learning Process?

- Let us give our students opportunities to learn by doing. Let us immerse our students in the world of experience.
- Let us make use of real things as instructional materials for as long as we can.
- Let us help our students develop the five senses to the full heighten their sensitivity to the world.
- Let us guide our students so that they can draw meaning from the first hand experiences and elevate their level of thinking.

5.3.2 Contrived Experiences

Contrived experiences are the edited copies of reality and are used as substitutes for real things when it is not practical or possible to bring or do the real thing in the classroom. They are designed to stimulate real life situations.



In here, we make use of a representative models or mock ups of reality for practical reasons.

Examples

1. Model

- A reproduction of a real thing in a small scale, or a large scale or exact size- but made of synthetic materials.
- It is a substitute for a real thing which may or may not operational –Brown, et. al, 1969

2. Mock up

- An arrangement of a real device or associated devices, displayed in such way that representation of reality is created
- A special model where the parts of a model are singled out, heightened and magnified in order to focus on that part or process under study.

3. Specimen

- Any individual or item considered typically of a group, class, or whole.

4. Object

- May also include artifacts displayed in a museum or objective displayed in exhibits or preserved insect specimens in science.

5. Simulation

- A representation of a manageable real event in which the learner is an active participant engage in learning a behavior or in applying previously acquired skills or knowledge -Orlich et. al, 1994

6. Games

Games are used in any of these purposes:

- To practice and/or to refine knowledge/skills already acquired

- To identify gaps and weaknesses in knowledge or skills
- To serve as a summation or review
- To develop new relationships among concepts and principles
- Why do we make use of contrived experiences?
- Overcome limitations of space and time
- To edit reality for us to be able to focus on parts or process of a system that we intend to study.
- To overcome difficulties of size
- To understand the inaccessible
- Help the learners understand abstraction

Ten general purposes of simulations and games:

- To develop changes in attitudes
- To change specific behaviors
- To prepare participants for assuming new roles in the future
- To help individuals understand their current roles
- To increase the students' ability to apply principles
- To reduce complex problems or situations to manageable elements

- To illustrate roles that may affect one's life but that one may never assume
- To motivate learners
- To develop analytical processes
- To sensitize individuals to another person's life role

5.3.3 Dramatized Experience

Dramatic- is something that is stirring, affecting, or moving.

Dramatic entrance- is something that catches and holds attention, and has emotional impacts.

By dramatization, we can participate in a reconstructed experience, even though the original event is far removed from us i time.

Dramatized Experiences can be range from:

Formal Plays

Depict life, character, culture, or a combination of the three. They offer excellent opportunities to portray vividly important ideas about life.

Pageants

Are usually community dramas that are based on local history. An example is a historical pageant that traces the growth of a school.

Pantomime

Is an art of conveying a story through bodily movements. The effects of pantomime to the audience depend on the movements of the actors.

Tableau

A picture-like scene composed of people against a background.

Role-playing

An unrehearsed, unprepared, and spontaneous dramatization of a situation where assigned participants are absorbed by their own roles.

Puppets

An inanimate object or representational figure animated or manipulated by an entertainer, who is called a Puppeteer. Puppets can present ideas with extreme simplicity.

Types of Puppets

1. **Shadow puppet-** flat, black, silhouette made from lightweight cardboard shown behind a screen.

2. **Rod puppets**- flat, cut figures tacked to a stick with one or more movable parts, and are operated below the stage through wires and rods.

3. **Glove-and-finger puppets**- make use of gloves which small costumed figures are attached.

4. **Marionettes**- flexible, jointed puppets operated by strings or wires attached to a cross bar and maneuvered from directly above the stage.

5.3.4 Demonstrations

It is visualized explanation of an important fact, idea or process by the use of photographs, drawing, films, display or guided motion.

5.3.5 Study Trips

These are the excursions, educational trips, and visit conducted to observe an event that is unavailable within the classroom

5.3.6 Exhibits

These are displays to be seen by specters. They may consist of working models arranged meaningfully or photographs with models, charts and posters. Sometimes exhibits are "for your eyes only".

5.3.7 Television and Motion Pictures

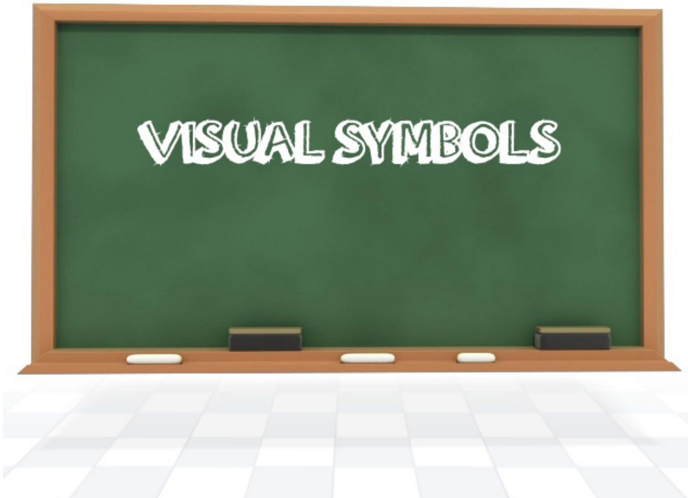
Television and motion pictures can reconstruct the reality of the past so effectively that we are made to feel we are there.

5.3.8 Still Pictures, Recordings, Radio

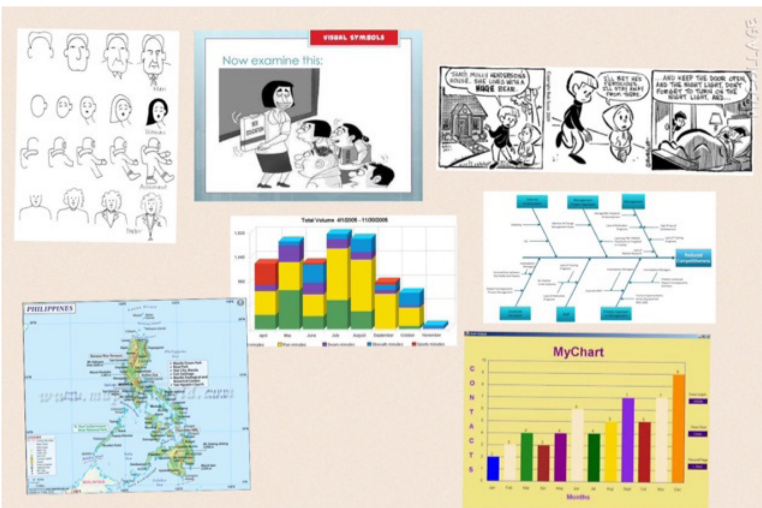
These are the visual and auditory devices which may be used by an individual or a group.

5.3.9 Visual Symbols

These are representations of direct reality, which comes in the form of signs and symbols. Like a picture a graph and all other visual symbols, are worth a thousand words, The proper use of visual symbols will contribute to optimum learning.



These are no longer realistic reproduction of physical things for these are highly abstract representations.

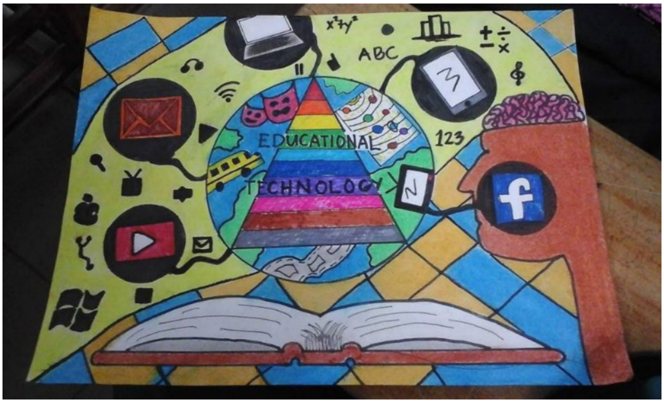


Kinds of Visual Symbols

Visual symbols come in many forms – drawings, cartoons, strip drawing (comic strip) diagram, map, chart and graph.

Posters

A combination of bold designs and color primarily intended to catch attention on a significant fact, idea or message.

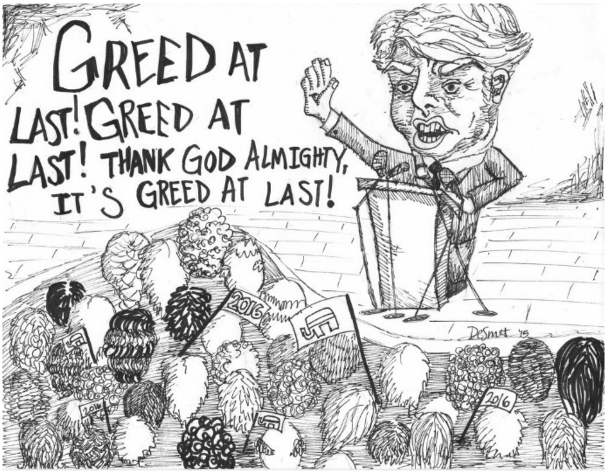


Drawings

A drawing may not be the real thing but better to have a concrete visual aid than nothing. To avoid confusion, it is good that our drawing correctly represents the real thing.

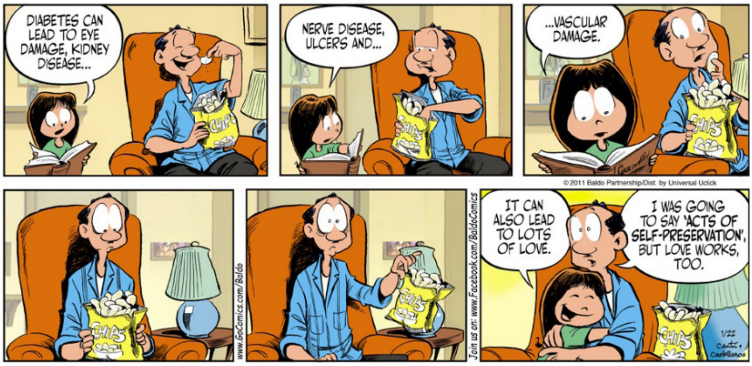
Cartoons

A fist rate cartoon tells its story metaphorically. The perfect cartoon needs no caption. The less the artist depends on words, the more effective the symbolism. The symbolism conveys the message.



Strip Drawings

A sequence of drawings in a newspaper, magazine, etc., relating a humorous story or an adventure. These are commonly called comics or comic strips.

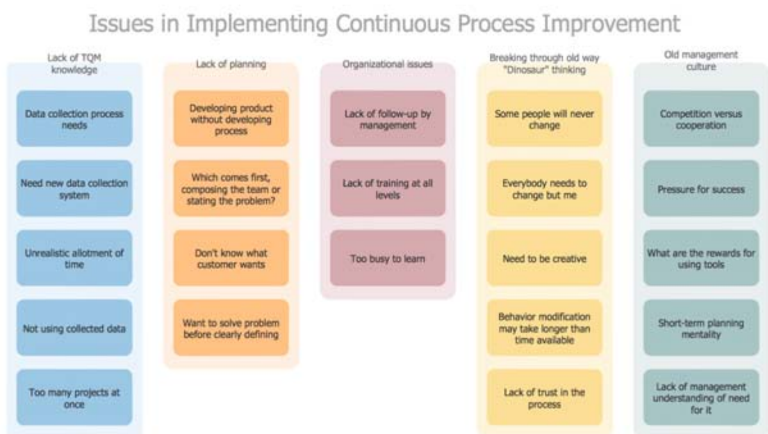


Diagrams

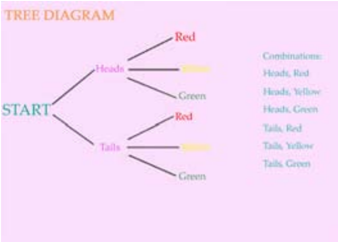
"It is any line drawing that shows arrangement and relations as of parts to the whole, relative values, origins and development, chronological fluctuations, distributions, etc." (Dale 1969)

Types of Diagrams

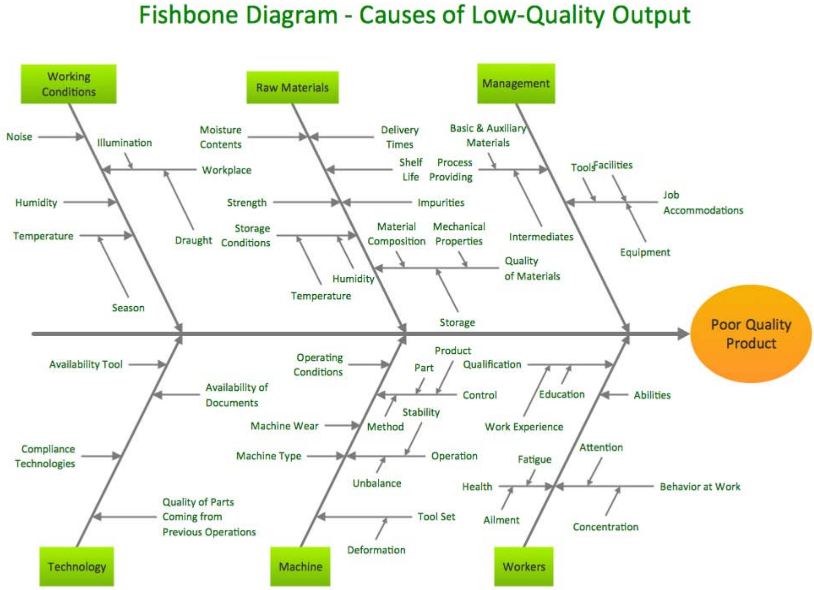
1. ***Affinity Diagram***: used to cluster complex apparently unrelated data into natural and meaningful groups.



2. ***Tree Diagram***: used to chart out, I increasing detail, the various tasks that must be accomplished to complete a project or achieve a specific objective.

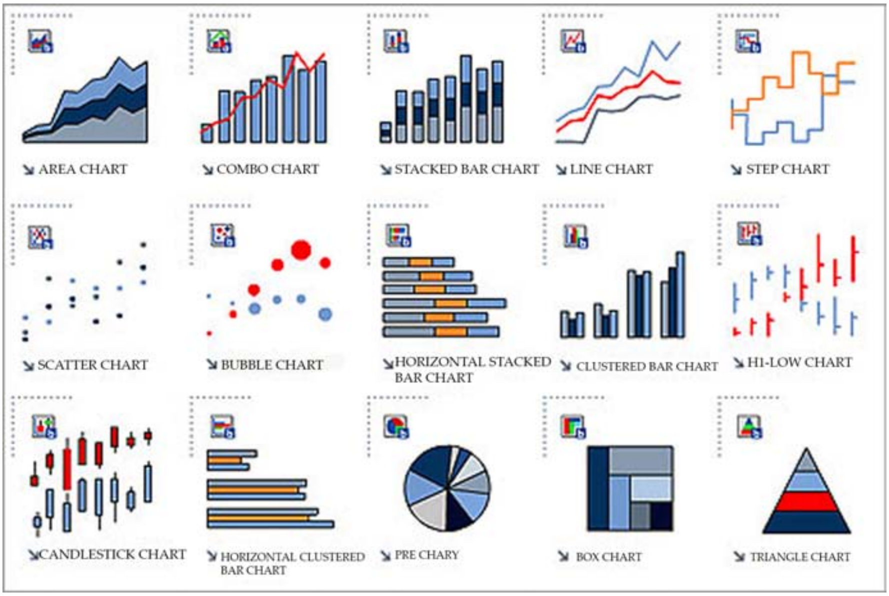


3. ***Fishbone Diagram***: It is also called cause and effect diagram. It is a structured form of brainstorming that graphically shows the relationship of possible causes and sub causes directly related to an identified effect / problem. It is most commonly used to analyze work – related problems.



Charts

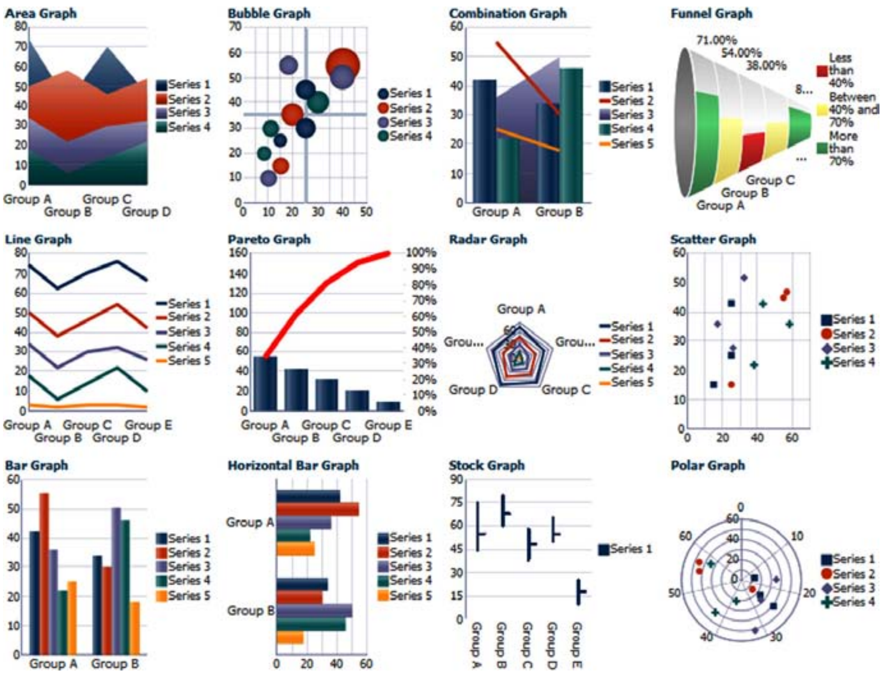
Is a diagrammatic representation of relationships among individuals within an organization. We can have different types of chart:



1. `*Time Chart:* is a tabular time chart that presents data in ordinal sequence.
2. *Tree or Stream Chart*: Depicts development, growth and change by beginning with a single course (the trunk) which spreads out to many branches or by beginning with the many tributaries which then converge into a single channel.
3. *Flow Chart*: Is a visual way of charting or showing a process from beginning to end. It is a means of analyzing a process. By outlining every step in a process, you can begin to find inefficiencies or problems.
4. *Organizational Chart*: shows how one part of the organizational relates to other parts of the organization.
5. *Comparison and Contrast Chart*: Used to show similarities and differences between two or three things.
6. *Pareto Chart*: Is a type of bar chart, prioritized in descending order of magnitude or importance from left to right. It shows at a glance which factors are occurring most.
7. *Gantt Chart*: Is an activity time chart.

Graphs

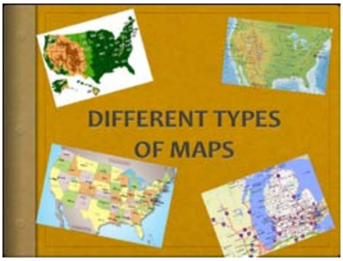
Pictures that help us understand data. There are several types of graphs. They are:



1. **Circle or Pie Graph:** Recommended for showing parts of whole.
2. **Bar Graph:** use in comparing the magnitude of similar items at different ties or seeing relative sizes of the parts of a whole.
3. **Pictorial Graph:** make use of picture symbols.
4. **Graphic Organizer:** you met several graphic organizers in your subject, principles of teaching.

Maps

Is a " representation of the surface of the earth or some part of it."



Kinds of Maps

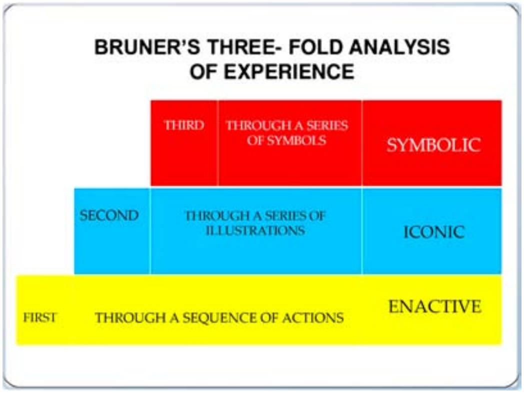
1. **Physical Map:** Combines in a single projection data like altitude, temperature, rainfall, precipitation, vegetation and soil.
2. **Relief Map:** Has three dimensional representations and show contours of the physical data of the earth or part of the earth.
3. **Commercial or Economic Map:** Also called product or industrial map since they show land areas in relation to the economy.
4. **Political Map:** gives detailed information about country, provinces, cities and towns, roads and highways. Oceans, rivers and lakes are the main features of most political maps.

5.3.10 Verbal Symbols

They are not like an objects or ideas for which they stand. They usually do not contain visual clues their meaning.

5.3.11 Three - Tiered Model of Learning

Harvard psychologist, Jerome S. Bruner, presents a three- tiered model of learning where he points out that every are of knowledge can be presented and learned in three distinct steps.



It is highly recommended that a learner proceeds from the ENACTIVE to the ICONIC and only after to the SYMBOLIC.

Three pitfalls that we should avoid with regard to the use of the Cone of Experience:

- Using one medium in isolation
- Moving to the abstract without an adequate foundation of concrete experience
- Getting stuck in the concrete without moving to the abstract hampering the development of our students' higher thinking skills.

5.4 NON-CONVENTIONAL AND MODERN TEACHING AIDS

1. **Interactive Whiteboard (IWB)**: The Interactive Whiteboard has replaced the chalkboard that enables the teachers to save their notes as a page on the board instead of wiping it out completely due to paucity of space. Using a digital projector this also allows computer

images to be displayed onto a board. The instructor can even manipulate the elements on the board by using her/ his finger as a mouse or even a stylus pen, directly on to the screen. Items can be dragged, clicked and copied and teacher's handwritten notes can be transformed into text and saved. The Interactive Whiteboard allows for printing, recording, editing, cut/copying, pasting etc from the board. It comes with a software and teaching resources that aids the teacher and effectively enhance learning and increase understanding among student. It is a powerful tool in the classroom, leading to interactivity and collaborative learning. It allows for group work amongst students replacing paper/poster presentations. It integrates a variety of media content into the lecture. IWB is an extremely flexible tool which is now commonplace in Private schools in Metros. However the Indian Universities have been relatively slower in adopting this technology.

2. **Computers and Internet**: Computers and the internet form a very important electronic resource that plays a central role in teaching-learning process. Whether one is a teacher or a learner, young or old everyone is completely immersed in the digital revolution. Computers and the Internet are a great teaching as well as learning resource for both the classroom teachers and the learners! Teachers can find suggestions, lesson plans, practical support, information, and materials through the Internet. In fact, using a computer can make a teacher's life easier and more efficient. The learners simply Google out what they want to find.

Computer in conjunction with internet is a useful non-conventional and modern teaching aid as:

- Books, materials, resources, researches are available online for both teachers and learners. This saves time in locating books in bookshops, libraries, etc. and money spent on purchasing books.

- Useful Websites can be integrated in the lessons, presentations.
- Learners can even continue project discussions outside their class too.
- Provide opportunities for Online discussion forums. Subject Experts, specialists can join discussions online.
- Electronic mails or emails can keep learners informed and updated.
- Webinars or web seminars and web conferences can make the entire teaching process lively.
- Especially designed online course materials can be accessed on UGC ePathshala or MOOCs.

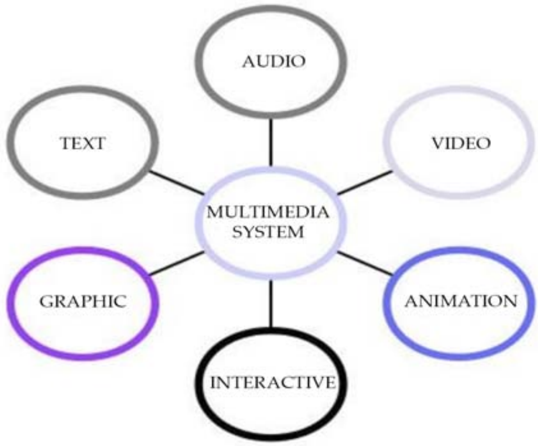
Use of computers requires a lot of skill. Even the creation of computer based teaching learning materials for class requires a lot of time on part of the teachers. If the teacher/facilitator is hosting online websites then maintaining it is a time consuming. Computer is a good resource but over reliance can compromise effectiveness of teaching.

3. **Live-Stream Multimedia**: Live-Stream refers to online streaming media that is simultaneously recording and broadcasting in real time to the viewer. It is also called streaming. This is a multimedia and which enables a person the live broadcast of events on the internet as it happens. Lectures, presentations and programs can be broadcast live as they take place. Students and parents can also connect to any program that is going on at any given time. It's a boon for the Distance learning students who can easily hook up with lecture online irrespective of their location. The services include hosting both social media sites to video games. Apps such as Facebook Live, Periscope and 17 include the streaming between users, streaming of scheduled celebrity events and promotions. For the past sometime, Twitch Plays Pokémon (TPP) video game live streaming has taken the world by surprise. The Pokémon Go a free-to-play, location-based augmented reality game was developed for iOS and

Android devices by Niantic. The game uses the player's mobile device's GPS ability to locate, capture, battle, and train virtual creatures, called Pokémon, which appear on the screen as if they were present at the same realworld location as the player. Sites such as Twtich.tv are popular for playing/watching video games, such as eSports, speedrunning. Let's Play-style gaming.

4. **PowerPoint/ Slide Presentations**: PowerPoint Presentations are very popular instructional material comprising of a series of slides using software as PowerPoint. They have replaced the transparencies and the Over Head Transparency Projectors- the Episcopes today. The PowerPoint presentations have even replaced the use of videos in classrooms. PowerPoint Presentations comprise of slide-based presentations. They have become an integral part of many teaching learning situations used with ease and comfort by teachers and students alike. The PowerPoint Presentations can be projected using the LCD Projectors. When the PowerPoint presentation includes audio-commentary it is possible for the teacher/ facilitator to deliver the entire lecture electronically. In such situations Teachers have to be cautious and keep their students interested and engaged. Discussions should flow freely and feedback taken continuously. These Presentations are of an immense use when information has to be passed on, concepts transacted and skills developed. PowerPoint presentations help in focussing student's attention & the visual impact of the slides enrich curriculum and also increase interactivity.

5. **Multimedia**: Multimedia is defined as any combination of text, graphic, sound, video and animation. Multimedia can be delivered to user via electronic or digital manipulated means. The development of multimedia has enabled learners to learn from any location. The elements of text, graphic, video, sound and animation in Multimedia can lead to interactive learning.



Multimedia Elements

Multimedia is both an evolution and a convergence of technology. The use of live-action video, feedback, questions and answers keep the learners attentive, interested and motivated, helping them enhance their skills.

6. **Multimedia Projector**: People learn in a variety of ways. The teaching learning process today incorporates a way variety of media as still and moving pictures, sounds, audio-video clips, and even live streaming in their presentations. In such presentations Multimedia projectors are utilized in educational institutes, classrooms, within Board rooms, at offices, home. The teacher prepares the lecture or presentation on a storage device a computer Disc or even a flash drive and then connects the projector to a PC and projects it on the screen or white board using the Multimedia projectors. Projects, pictures, images, Power point presentations, graphics can all be used for presentations. This modern teaching aid facilitates teaching and enhances learning.
7. **WhatsApp**: WhatsApp is meant for communication. Education too is communication. WhatsApp allows free unlimited messaging. Realizing the speed and instantaneous seamless transfer of messages between the

sender and user, the Teachers and Facilitators are forming WhatsApp groups as an alternate tool for teaching and learning. WhatsApp uses a technology students are most familiar with: their mobile phones WhatsApp is being used by teachers:

- To stay connected with learners outside the classroom
- Use the Group Chats feature to create learning and study groups
- Send assignment submission, presentation and test reminders
- Answer questions and queries as when posed by learners.
- Assign problems and allocate assignments to learners when they are not in class
- Share relevant video and audio links, videos and audios with students
- Its very cost effective

8. **Radio**: Radio waves to carry information from the source to the receiver/audience in radio transmission. Amongst all the available means of communication radio has the maximum reach in India covering 97 per cent of India's population can access radio stations. Radio is the most sought after medium of entertainment and education. The educational use of radio in schools, universities and farmers led to the development of Interactive Radio Instruction (IRI), Radio Rural Forums (RRF) and community radios.

In 1990 Project in Radio Education for Adult Literacy (PREAL) was launched in 1990 by NLM and the All India Radio (AIR) primarily for the women beneficiaries in 17 technology demonstration districts of four low literacy States of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh

Gyan Vani was launched in March 2000. The radio station operating on 105.6 FM frequency. Gyan Vani operates in several cities of India. Each station covers an entire city including the adjoining rural areas as it has a range of about 60 km. It is functional as a media cooperative with programs contributed by different educational institutions, NGOs, government, semi-government organizations, UN agencies, ministries of Agriculture, Environment, Health, Women and Child Welfare, Science & Technology, etc. on a day-to-day basis. National level institutions such as NCERT, NIOS and state open universities also contribute their programs to it.

Jamia Community Radio run by Jamia Millia Islamia had its first trial live transmission for 60 minutes on 15th March 2005. It was formally inaugurated on 6th March 2006. It serves to create an informed, educated and a confident community. The members of the community, who frequently take part in the production of shows, fulfill the objective of improving lives and thoughts of target audience and cater to their specific interests and demands.

Radio is a one time and one-way broadcast medium but with high degree of immediacy, realism and emotional impact. Since it is a cheap medium it is ideal for information, education and communication for the masses.

9. **Television**: Television means to see over a distance. Television is a powerful telecast medium and has an advantage over radio as it provides both visual as well as auditory experiences. It can hook up viewers and mesmerize them across the limits of time and space. Television entered India on 15th September 1959 as a UNESCO sponsored pilot project with education as its sole aim. It was much later that entertainment was included in its mandate. Educational experiments in Television in adult education include Khilti Kaliyan (Translation: Blooming Buds). Khilti Kaliyan was a 24-episodes TV serial telecast on Delhi Doordarshan for a period of 24-weeks. Intended for women between the age group of 15-35 years, it was based on the literacy primer Khilti Kaliyan and hence the name. The serial focused on social, economic, political issues related to oppression, deprivation and marginalization faced by women so that the need for literacy could be kindled in them.

Chauraha (Translation: The Cross Roads) was a 40-episodes tele-serial of 15-minutes duration each was telecast on Doordarshan for adult literacy in 1992 for a period of 6- months. The Directorate of Adult Education (DAE) and the State resource Centre, Jamia Millia Islamia, New Delhi conducted this UNICEF sponsored experiment. The idea was to teach reading and writing of Devanagri (Hindi) to illiterate learners. The episode gad a narrative storyline, high on emotions, incorporating awareness on development issues. Everyday images were superimposed with the Hindi letters to be taught, in a way following learning by association.

Since its advent a large number of educational TV programs have been running for schools, universities and farmers in India- SITE, UGC School Program, NIOS Educational TV, IGNOU Country wide classroom.

Television not only diffuses requisite information, but can also change attitudes and impart skills to the learners. Its mesmerizing qualities, visual impact and far & wide coverage further enhance its mass appeal. But when Television is used by the Teachers they have to keep in mind that program can only be beneficial if it makes connect with the concept that has been transacted to the learners. While the developed countries are taking full advantage of television in education there is a greater scope of its use in developing countries also.

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CHAPTER 6

MULTIMEDIA IN EDUCATION

INTRODUCTION

Multimedia is a form of communication that combines different content forms such as text, audio, images, animations, or video into a single presentation, in contrast to traditional mass media, such as printed material or audio recordings. Popular examples of multimedia include video podcasts, audio slideshows and Animated videos.

Multimedia can be recorded for playback on computers, laptops, smartphones, and other electronic devices, either on demand or in real time (streaming). In the early years of multimedia, the term "rich media" was synonymous with interactive multimedia. Over time, hypermedia extensions brought multimedia to the World Wide Web.

There has been a rapid growth in recent years in the uses of digital technologies in education, which mirrors the increasing importance of the use of these technologies in the world in general. In mainstream education in many parts of the world, the uses of digital technologies have been constantly increasing and we find ourselves in situations in which all teachers are being expected to demonstrate their ability to use such technologies as part of their teaching toolkit.

Multimedia applications are moving from a single PC environment to either a multi-user environment or to a personalized user environment." The rapid innovation and development in information and communication technologies has been increased the used of multimedia applications in our daily life and brought the changes to computing, entertainment and education. However, educational multimedia applications will not going to replace the roles of teachers or lecturers, it will only allow students to learn more when compare with traditional teaching methods.

Multimedia applications for educational purposes are similar like the printed text books and other teaching materials, but they can be come in a wider range of sources. The potential of multimedia applications for educational purposes is well-recognized by the universities, school, government and private organization. Educational multimedia applications can be more focused on specific objectives or in more comprehensive ways.

There has been an increase in demand of educational multimedia applications at all level of citizens for them to apply their knowledge in different field of study and situations. Multimedia applications had greatly influenced the education in many ways. They give teachers or lecturers to prepare study materials for students in a more clearly and comprehensive way such as demonstrate and visualize the study material in a multimedia presentation. Multimedia applications can also be used as a source of information. Multimedia applications can be developed to enhance the learning process and increase the interaction between students and lecturers. Lecturers can make the lesson more interesting by using the multimedia presentations. As the information is presented in variety ways, multimedia applications enhance the user experience and make the learners easier to grasp the information.

6.1 CONCEPT OF MULTIMEDIA IN EDUCATION

The concept of multimedia is defined in many ways. Most of the definitions agree on the characteristic that multimedia contains texts, graphics, animations, video and sound in an integrated way and the content can be structured and presented differently. One of the most crucial characteristics is the interactivity of multimedia products used. Rhodes and Azbell distinguish three forms of interactivity:

- *Reactive interaction*: Learners give responses to a presented stimulus. The order of tasks is strongly determined and the individual influence on the program is small.
- *Proactive interaction*: Learners control the program. They make decisions on the order of tasks or where to navigate within the application.
- *Mutual interaction*: Learners and program are able to adapt to each other.

These forms differ in terms of user control. At the reactive level, the producer/designer has total control over the content, its presentation, sequences, and practical assignments. At the pro-active and mutual levels, there is more flexibility for the user.

According to Reimann, interactivity contains a broad range of possibilities for influencing the process of learning and the content of studies:

- *Manipulating objects* on the screen by mouse activities;
- *Linear navigating*: moving forward/backward on the screen;
- *Hierarchic navigating*: the possibility of selecting sites/ content by using special menus;
- *Interactive help functionality*: This kind of help, which can be available through special menu buttons, is most effective when adapted to the topical presentation of information;
- *Feedback*: The program answers by giving an assessment on the quality of user activities. These answers are visible on the screen. The further course program may be dependent on this assessment, i.e. adaptability is established;
- *Communicative interaction*: The possibility of interaction with other persons, i.e. other users or 'friends' in social networks. Since, 'social networks consist of people who

are connected by a shared object', networks can foster learning about these objects.

- *Constructive interaction*: The program provides an opportunity for constructing or configuring objects on the screen. For example, users have a possibility to actively create their own nodes and link models, i.e. they can add new nodes and new links between already existing nodes and in this way develop their own hypertext structure;
- Reflective interactions: The program stores the learner's individual activities for further analysis (e.g. a navigation path within a hypermedia lesson). Furthermore, the program can provide the learner with an 'expert path' or a 'guided tour';
- *Simulative interactivity*: Objects on the screen are linked together and exchange information in such a way that a particular configuration of objects produces 'behavior' of these objects (simulations of machines, simulations of social interactions, etc.);
- *Non-immersed contextual interactivity*: The learner is involved in an activity that implies a pedagogical purpose. Many edutainment applications (software which combines education and entertainment) and adventure games use this kind of interactivity.
- Immersed contextual interactivity: This is virtual reality. Within virtual reality the user dives into a simulated three-dimensional world.

6.1.1 Why use multimedia in education?

Using Multimedia for Knowledge Construction

Multimedia can be viewed as a learning tool and a means of communication. Within learning situations, multimedia products and online services can be used creatively and reflectively.

Furthermore, multimedia can be used to foster learning subject matters and cross-curricular topics. General goals of education frame the use of multimedia in education. The following goals of education can be considered as important:

Construction of meaningful and understood knowledge: This means the development of a well-structured, disciplinary, interdisciplinary and daily-life-oriented system of flexible and usable competencies, abilities, skills and content knowledge.

Construction of applicable knowledge: How to transfer meaningful and understood knowledge into applicable knowledge?

Construction of knowledge about learning: This important competence enables students to be experts of their own learning processes. Consequently, reflection and metacognition of learning processes support the construction of meaningful and understood knowledge as well as applicable knowledge.

Learning

Many definitions of learning take into account the realization of these learning opportunities and the development process of understanding, capacity, disposition, etc. One has learned when one has developed new understanding or capacity.' Some aspects are decisive for this development of new understanding and/or capacity. According to current learning theories, some important learner aspects are:

- Capacities and abilities (physiological and intellectual prerequisites, previous knowledge concerning the topic, etc.);
- Interests, learning strategies, metacognitions, conceptions of learning, motivation, emotions, attitudes concerning the content to be learned, social competencies, etc.

Most concepts of learning agree that two factors are essential to learning:

- Social contacts and relationships to people (family members, classmates, teachers, friends), i.e. communities of practice, communities of communication and cooperation;
- Learning objects, i.e. learning materials (books, videos, tapes, and multimedia products), physical objects and artifacts, and virtual learning spaces.

Also the environment in which learning takes place influences learning. This includes the structure, conditions and access to the environment itself (society, libraries, media resource centers, computer labs, nature, cities or countryside, etc.).

In this sense, multimedia applications can be used as one out of many learning environments that are suited to be used in different learning situations, where learners are mulling over the subject matter and engaging in a dialog with peers and teachers concerning their learning experiences.

Learning Goals

In order to handle this complex situation, in which learning takes place, it is recommended to have explicit learning goals. Teachers and learners typically define these objectives within the frame of the curriculum.

They can be specified as a combination of the declarative knowledge (knowing that), skills (knowing how), and ability of learners to use knowledge, skills and personal, social and/or methodological abilities.

The learning units do not state the domain specific knowledge of multimedia applications, i.e. the explicit knowledge represented in these applications. Since this content can refer to many different subject matters at many levels, the units only contain examples of the explicit knowledge that are stored, processed, and presented by means of educational multimedia.

It is recommended that instructors of particular courses provide proper examples of multimedia products that can foster learning in the teaching fields of participants.

It has been known for many years that educational multimedia – under certain conditions – can be used as effective learning objects. Learning with multimedia can foster different aspects of learning:

- Firstly, it can foster cognitive aspects of learning such as information processing and understanding.
- Secondly, it can increase motivational aspects of learning.
- Thirdly, it can increase collaborative or social-cognitive aspects of learning.
- Fourthly, educational multimedia has the potential of fostering learners' deep approach to learning and consequently deep learning.

Multimedia products and online services provide many opportunities for these different aspects of effective learning. The potentials are, among others, to:

- Use several perception channels during the learning processes and hereby anchor information processing with several senses;
- Simulate complicated real experiments;
- Visualize abstract contents;
- Present processes in a dynamic manner in order to stimulate learners' cognitive structures and interpretations by embedding the content in the broad context of environment, society, history and by relating to the interpretation made by the learner;
- Foster collaborative learning through online discussions in blogs, web groups, etc.

6.1.2 Elements of Multimedia Application in Education

Although the definition of multimedia application is simple, making it work can be complicated. We need to understand how to make each multimedia element together using educational multimedia computer tools. The elements used in multimedia applications have all existed before. Educational multimedia applications combine those elements into a powerful new tool, especially in the hands of teachers or lecturers and students. Multimedia applications can be used in many areas, for example like educations, businesses, homes and public places. For educational purposes, students can explore variety of information for further understanding by using multimedia applications. Educational multimedia applications are used to improve learning effectiveness. A multimedia learning environment involves numbers of elements in order to enable learning process taking places. There are six main elements in multimedia applications for educational purposes which are texts, images, audio, video, animations and user control.

Firstly, text is an important element in multimedia applications; it can use to provide information and emphasize specific point by using different styles, fonts, and colors. Secondly, image is an object that has more significant impact than merely reading about text in an educational session.

Image can be added to multimedia applications by using color scanner or digital camera. Examples of image are photographs, artworks, drawings. Thirdly, audio can be used to emphasize certain points and enables teachers to presents a lot of information at once rather than use printed learning resources. Audio allows students to use their imagination without being biased, so it will greatly increase the learning outcome. Fourthly, video can be used to present the information beyond the scope of the ordinary lecture room such as medical operations. The use of video to deliver information can be very powerful and immediately, it allows teachers or lecturers to highlight certain key points or tell the students what are going to do next and understand the real life situation. Fifthly, animation is used to demonstrate an idea or illustrate a concept; an object that appears blurry in video can be presented clearly in animation because it can view the changes of the object over time. Lastly, user control uses to provide students with the option to skip particular parts of the multimedia application and allow them to navigate other areas of that program. All of the elements are combined to provide a platform for students to maximize the effectiveness of educational purposes.

6.1.3 Advantages of Using Educational Multimedia Applications

The growth in use of multimedia applications for educational purposes has accelerated in recent years, and looks set for continued expansion in the future. The multimedia applications play an undeniable role in education. Multimedia applications have many advantages that allow teachers and lecturers to provide other advice which tailored to particular group of learners' needs. Teachers or lecturers discover the ways to boost student's interest and motivate them by using educational multimedia applications. Students can also active involve in the learning process by using multimedia applications such as CD-ROM based textbook, tutorials and laboratory experiments. Multimedia applications increase the learning effectiveness and are more attractive than traditional-based learning methods. This new learning environment definitely influence the way of teachers or lecturers teach and the way students learn.

Teachers or lecturers continually search for more effective ways to attract their students during learning as well as to increase student learning outcomes. People learn better from words and pictures than from words alone. Therefore, educational multimedia applications use a combination of multimedia elements to present and emphasize particular points only, thus it is more effective because the students are easier to put attention on it rather than on static printed learning materials. Students often split their attention when they are forced to focus information that is far apart, or it is presented at two separate points at the same time. Therefore, when the related content is presented in words and picture at the same time, the learning outcome is more effective. Research found that students will participate in the lesson more actively when teachers or lecturers integrates multimedia element in learning process because they will pay more attention as the lesson becomes more interesting. For example, when the animation and narration are presented simultaneously, students are easier to understand and that information can be quickly integrated into long term memory. A multimedia presentation is an example of multimedia application, it can highlight certain information that teachers or lecturers wants to deliver.

Multimedia applications are used to grab student's attention and generate interest during learning process. It can improve the student's attitude toward content and learning. Multimedia applications enable students increase their memory of content and foster deeper learning when compared to traditional teaching ways that use by teachers and lecturers. Multimedia applications for educational purposes also can make the learning fun and decrease the anxiety and tension toward certain scary subjects.

There is no doubt that the important role of multimedia applications for educational purposes because it can influence the way of teachers or lecturers teach and the way of students learn. Multimedia applications are easy to use by the students or lecturers. Students are able to navigate and retrieve the information quickly because they have the ability to interact with the multimedia applications. Students can learn more when they can control pace of the presentation such as slow down, start and stop at certain information as they want. Multimedia applications are tailored the information need to the individual because it can be presented in different ways to engage students with different learning styles and strengths. Every student may have different preferences and modes to learn about something. As an example, a student prefers to read certain learning materials from prints, while another student may prefer a visual presentation. Therefore, multimedia applications for educational purposes are effective to all particular students and lecturers because it is tailored to their needs.

6.1.4 Disadvantages of Using Educational Multimedia Applications

Multimedia applications for educational purposes that delivered the learning materials via videos or images need computers, projectors and other electronic devices, so the expenses for these applications can be very expensive. Normally multimedia applications for educational purposes are more expensive than printed text book because it requires expensive hardware. Multimedia applications also not so easy for configuration and requires special hardware to run it.

When lecturer uses educational multimedia application, he will shift his role from instructor to facilitator. As the amount of multimedia elements increase, it will slow down the delivery and pace of the learning process. For example, a student was allowed to complete the lesson at their own pace as they navigate the stage of learning materials or students works in a group to view multimedia applications, some of them maybe are not proficient with the technology, thus they need to spend more time on learning computer skills rather than access the information. Sometimes educational multimedia applications are not effective for those who have weak learning skills.

From student's perspective, there is disadvantage exist in educational multimedia applications. Multimedia applications have the limitation such as making an e-learning accessible to all students. For example, some of the applications may not suitable to certain students. A hearing impaired student cannot heard the streaming of audio, thus these multimedia applications are not accessible to all students.

Another disadvantage of multimedia applications for educational purposes is that students feel isolated and unsupported by teachers or lecturers when they don't understand certain topics. Teachers or lecturers are not always available when students need help from them; as a result they need to work independently without assistance. Hence, educational multimedia applications are least effective to those who need guidance and assistance from teachers or lecturers.

6.1.5 Characteristics of Educational Multimedia Applications

There are few characteristics of multimedia applications in education which are screen design, interaction and feedback, navigation, video and audio elements on the development in education.

Firstly, screen design is use to coordinate text and graphic elements in order to present sequenced content to facilitate learning and enhance student's understanding. Each instruction that display on screen in a multimedia application must provide effective instruction and navigation tools to the students. Screen design also use to boost the interest of the students and convey the required information to them. In short, a good screen design should require focusing student's attention, maintaining their interest, promoting processing and engagement between student and lesson content, help student find and organize the information and facilitate lesson navigation.

The second characteristic is interaction and feedback, it allows student to interact and control the flow of information and stage of learning with the multimedia application. Interaction and feedback also enable student active participant in the instruction learning process and provide feedback immediately following a student response. Feedback is information about the correctness or appropriateness of student's response which usually displayed on screen.

Third characteristic of multimedia applications for educational purposes is navigation. Navigation feature can enhance learning outcome and make an interactive multimedia applications easy to use by the students. Navigation provides students some control over the events and allows them to jump into new sections or revisit the information from earlier screen. Students can also learn and understand more when they can control the multimedia applications such as slow down, start and stop at certain information as they want.

Lastly, video and audio elements on the development in education have advantages to present the information to those students who have poor reading and learning skills. Students are easier to understand the lessons which use audio and video to convey the information rather than static learning materials. When audio and video is used to support text, it can provide an opportunity for the students to pause and repeat the sound.

6.2 COMPUTER ASSISTED INSTRUCTION (CAI)

Computer-assisted instruction (CAI), a program of instructional material presented by means of a computer or computer systems. The use of computers in education started in the 1960s. With the advent of convenient microcomputers in the 1970s, computer use in schools has become widespread from primary education through the university level and even in some preschool programs. Instructional computers are basically used in one of two ways: either they provide a straightforward presentation of data or they fill a tutorial role in which the student is tested on comprehension. The student is asked a question by the computer; the student types in an answer and then gets an immediate response to the answer. If the answer is correct, the student is routed to more challenging problems; if the answer is incorrect, various computer messages will indicate the flaw in procedure, and the program will bypass more complicated questions until the student shows mastery in that area.

There are many advantages to using computers in educational instruction. They provide one-to-one interaction with a student, as well as an instantaneous response to the answers elicited, and allow students to proceed at their own pace. Computers are particularly useful in subjects that require drill, freeing teacher time from some classroom tasks so that a teacher can devote more time to individual students. A computer program can be used diagnostically, and, once a student's problem has been identified, it can then focus on the problem area. Finally, because of the privacy and individual attention afforded by a computer, some students are relieved of the embarrassment of giving an incorrect answer publicly or of going more slowly through lessons than other classmates.

There are drawbacks to the implementation of computers in instruction, however. They are generally costly systems to purchase, maintain, and update. There are also fears, whether justified or not, that the use of computers in education decreases the amount of human interaction. One of the more difficult aspects of instructional computers is the availability and development of software, or computer programs. Courseware can be bought as a fully developed package from a software company, but the program provided this way may not suit the particular needs of the individual class or curriculum. A courseware template may be purchased, which provides a general format for tests and drill instruction, with the individual particulars to be inserted by the individual school system or teacher. The disadvantage to this system is that instruction tends to be boring and repetitive, with tests and questions following the same pattern for every course. Software can be developed in-house, that is, a school, course, or teacher could provide the courseware exactly tailored to its own needs, but this is expensive, time-consuming, and may require more programming expertise than is available.

6.2.1 Characteristics of CAI

In CAI there are two way interactions between an individual student and the computer just as happens in the tutorial system between the teacher and an individual student.

The computer is able to display the instructional material to the individual student.

The individual student takes benefit of the displayed material and responds to it. These responses are attended by the computer for deciding the future course of instruction displayed to the learner.

The interaction between the individual learner and the computer device helps in the realization of the set instructional objectives.

6.2.2 Basic Assumptions

The computer assisted instruction, meant for auto-individualized instructions, rests on the following basic assumptions:

Instruction for a number of learners at a time: CAI can serve at a time thousands of learners in an individualized way. What an individual needs according to his ability and interest in a particular subject or topic, and accordingly he can get the instructional material and help him in such individualized way. Hence the first assumption of CAI lies in its capacity of providing quality and quantity auto-instruction to a sufficiently larger number of the individual learners at a time

Automatic recording of the learner's performance: How does an individual learner react to the presented instructional material?, what are his quarries and difficulties?, what is his performance in terms of learning outcomes? .All such things can be successfully and accurately recorded by the computer device. It helps much in further planning the needed instruction to the individual learner for this proper advancement. This timely and proper auto recording is the second assumption underlying CAI.

Variety in the use of methods and techniques: CAI assumes that every learner cannot be benefitted through a single method and all the subjects or topics in a subject cannot be handled through a common method or strategies. It believes that there should be a wide variety of methods and approaches for imparting instruction in a particular subject or topic so that all the individual learners may be able to choose a particular method or approach according to their own interest, ability, and nature of the instructional material.

6.2.3 Technologies of CAI

CAI requires joint efforts of various persons in the matter of wise handling of men and material resources. Generally, it involves three types of techniques, namely hardware, software, and courseware.

Hardware: The computer as a machine represents the hardware. In CAI, we certain lyneed an appropriate computer to suit our teaching learning situations. It will require the services of an expert or technician for its maintenance and an operator.

Software: The computer cannot do anything for imparting instruction to the learners if it is not fed with the software. The programs containing instruction to the computer in a language that it can understand are called software. These programs are developed by the experts called programmers. The software used in CAI is of two kinds: application software and system software. The application software includes instruction to the computer for carrying out a total function required by the user.

Courseware: The courseware technology is the base of the instruction that is imparted to the learner by CAI. For the instructional purpose, the computer machine as hardware will need the service of the software. These programs will be prepared by a software programmer. But for its preparation he will certainly require the services of those who are experts in courseware technology who include: experts in the subject, experts in methodology and strategies of teaching the subject, experts in instructional psychology, and in audio visual aid preparation and use. What the courseware technology will prepare in terms of the instructional material and method of instruction etc. will be translated by the software technologies into software programs for being used in the computer machine. In this way these three technologies and the persons operating them are jointly responsible for the preparation of the instructional activities conducted in CAI.

6.2.4 Types or modes of CAI

CAI can take a variety of forms as detailed below for providing self-individualized instructions to a learner depending on the computer services availed.

Informational instruction: It helps the learner get the desired information he needs. Hence the computer can serve the role of an enquiry officer, to respond to the student's enquiry with answers it had stored. It provides minimal interaction between the student and the computer program. The sole purpose of this type of CAI is to provide essential information for the acquirement of concepts, and skills. However the individual learner can learn a lot by adopting an enquiry or discovery approach towards self-learning through such instruction.

Drill and practice: CAI provides the learner with different types of drill and practice programs covering specific topics related to particular subject. Through these, the service of computers can be properly availed for providing practice in something already learned in some other way. It helps in the development of a variety of skills. For example, for providing practices in multiplication skill, the computer may display on the screen a simple problem like 7×8=---- The child is required to respond to typing the numeric keys of the keyboard. If the answer is wrong, the computer immediately displays WRONG and if the answer is correct, another problem for carrying out the practice is presented. These responses comes within a fraction of second, therefore the child has not to wait for the answer for feedback. On the other hand, the computer has the required Patience to wait and allow the child to go ahead with his own speed and intention of responding and move forward. The advanced programs on drill and practice select the problem of varying difficulty levels on the basis of the student's performance during the earlier sessions .the computer is known to have a good memory for the errors of the learners and, therefore, provides a very effective teacher in providing the students proper material for their drill and practice.

Tutorial type computer assisted instruction: In this type of CAI, the computers are engaged in actual teaching. Here they can play effectively the role of a tutor by maintaining a perfect interaction and dialogue with the individual students. The tutorial programs are prepared not only to have instruction in topics such as Newton's laws of motion, sets and their operations, solar and lunar eclipses performance and move the students on the path of progress according to their own pace, abilities and requirements. If the students have been able to master a concept, the CAI program provides the next step of instruction, but if he is not able to achieve mastery, the program provides remedial instruction.

Educational game type: In it, the learners are provided with a variety of well-designed computer games. These games should not be confused with academic type games. Their purpose is only to provide intellectual challenge, stimulation of curiosity and serve as a source of motivation to the individual learner. In a course of learning, these games can be used as a source of review or as a reward for some accomplishment for the learner.

Simulation type of instruction: Stimulation is used as a technique for [providing training to the students. Such type of instructional activities provides powerful learning tools to them. With the carefully prepared programs, the students are made to face real or idealized situations. They have to play an active role and are required to take decisions that have consequences. For example, a simulation computer program may put the participants in the shooting range of enemies in the battlefront or in the role of a hunter in a jungle full of horror or beasts or in the role of an explorer who is looking for a buried treasure. The stimulation in all these proves much less expensive and dangerous to have a trainee blow up something on the screen than to face real danger to make a real mistake while trained in real situations.

Problem-solving type: This type of CAI focuses on the process of finding an answer to a problem rather than the answer itself. Here, the students are provided with programs that can make them think about the ways and means of solving the problem systematically. With the concrete ways suggested in the programs, the student can divide or analyze the problem into its small constituents and are able to devise systematic procedure for its solution.

Practical work oriented instruction: CAI programs can provide valuable help in supplementing laboratory and other practical work. A student can learn so many things about the science experiments before actually performing them in his practical class by watching and following a computer program made for this purpose. Similarly he can avail the necessary skills and experiences about practical task in other fields before actually engaging in such practical activities. Thus the children will have a necessary preparation and background from computers for their better performance at the school hours.

Learning affairs managing type: In this type instructional activity, the CAI program provides valuable help in managing and supervising the learning affairs of the students. They can have a proper check over the learning activities of individual students by identifying their academic weaknesses through extensive diagnostic testing and to prescribe educational program to meet their individual needs. They can give assignments, help in self-study, library reading, and group work, take a test over assignment, keep progress chart and guide the teacher as well as parents to plan their children's education.

6.2.5 Merits of CAI

In describing undergraduate CAI in biology, chemistry, and physics McKensie (1977) cites eight advantages and four criticisms of the method. The advantages of CAI are:-

- The immediate feedback provided by interactive terminals keeps students interacting and eager to keep trying.
- Wiser students are obliged to participate actively. Then often remain passive in lectures.
- The computer will wait patiently for an answer and will not express annoyance with wrong response.
- The graphic facility is a powerful aid in enhancing intuition, especially in giving insight, into mathematical formulae
- Interactive graphic makes it possible to sample many more illustrations than could easily be shown in a textbook.
- Mathematical calculations can be done as readily for realistic examples as for artificially simple case that can be solved analytically.
- Large volume of data can be handled with accuracy and without drudgery.

6.2.6 Limitations

1. The instruction of CAI in class room proves quite expensive and uneconomical in terms of educational returns.
2. Computer, as an electronic device, may invite significant hazards to children. There is a potential danger for the children either to damage the machine or to be damaged by it.
3. Much of the difficulty is felt on account of the unavailability or usability of the educational software.

Either we don't get any program for a particular type of instruction and teaching of a topic.

4. Serving of the hardware also poses a serious problem. If for one or the other reason the machine is failed, the expertise to operate it again or do repair work is not easily available. Consequently, the regular instructional work on self-study of the students may receive a major setback.
5. `The auto-instruction or self-study carried out in the form of CAI is basically a learner's controlled instruction. Here, the learner is the master of the whole instructional process and thus there is a little scope for keeping restraint and check on the learner. It may lead to indiscipline, truancy, carelessness, and unnecessary wasting of time on the part of the students.
6. During long study hours, this exercise may prove quite boring, mechanical, and tiresome.
7. CAI cannot be accommodated properly in the setup of our schools comprising set time table schedules, uniform curricula and group oriented instruction And examination system.
8. The other major limitations of CAI lies in the fact that computers are machines and no machine can ever match the human beings for effective interaction with the human beings. The emotional touch, warmth and sympathy as well as the heart link established in teacher pupil interaction are not possible in CAI.
9. CAI fails to develop language competency

6.3 TELECONFERENCING

The word 'tele' means distance. The word 'conference' means consultations, discussions. Through teleconferencing two or more locations situated at a distance are connected so that they can hear or both see and hear each other. It allows the distant sites to interact with each other and with the teaching end through phone, fax, and e-mail. The interactions occur in real time. This means that the learners/participants and the resource persons are present at the same time in different locations and are able to communicate with each other. In some situations, questions can be faxed/e-mailed early for response by the resource persons.

Three essential features of teleconferencing are:

- Learners/participants present at particular time and in dispersed places
- Resource persons present at the same time at the teaching end or different teaching ends.
- Interactions between
  - Learner – resource persons/AV materials at the teaching end(s).
  - Learner – learner at the learner center
  - Learner – facilitator/materials/activities at the learner center
  - Learner – learner at/between other learner centers
  - Resource person – resource person.

The communication in teleconferencing is both vertical and horizontal, and the emphasis is on interaction at all levels. Meaningful interaction in real time is the strength of teleconferencing, and this sets it apart from other technologies used in education. The one-way limitation of educational broadcasting is overcome through the technology configuration.

Stimulating responses to visuals, situations, dialogue, discussion, sharing, active experimentation, project work, etc. encourage interactivity, resulting in different transactional processes such as:

- Conceptualization
- Concretization of experience
- Reflective observation
- Application

These and other transactional processes of this nature accelerate learning and communication skills. Learning is systemized as it takes place in a structured teaching-learning environment.

Teleconferencing could have different technical configurations and applications. It includes use of telephone for audio conferencing, graphics in addition to audio for audio-graphic conferencing, television and/or computer for video conferencing. The video conferencing could be one-way video two-way audio or two-way video. The configuration can be simple or complex. The presentation can be just talk/discussion or it can be highly structured using sophisticated visual support.

6.3.1 Functions of Teleconferencing

The functions of teleconferencing in education and training are to:

- Impart information, build attitudes, provide role models, etc
- Upgrade skills
- Share experiences
- Facilitate problem solving
- Offer counseling
- Supervise/conduct/guide project work

The leaner and participant groups could vary from students, teachers, grass root level functionaries, community groups, farmers, housekeepers, experts, administrators to high level executives.

6.3.2 Uses of Teleconferencing

Teleconferencing is essentially a means for communication and training. It can be used for information dissemination, guidance in response to policy, consultations with experts, focused group discussions, interviews, etc. As a technology, it has broad applications in education, training and development, business/ corporate communication, governance and professional and medical courses/services.

Education

Teleconferencing is useful for the following activities:

Delivery of full courses, lessons, tutoring, project work and training can be provided to the students through teleconferencing,

- Delivery of certificate level courses for professional development. These courses can be modular and multi-media in nature comprising print, contact programmes, and audio-video conferencing.
- Partial support to courses through counseling, etc.
- Introduction of short/new courses in skill development, vocational training, professional development, and to address problems related to introduction of new curriculum, and lack of teachers and facilities.
- Tutoring in difficult areas of the curriculum.
- Remedial learning and off-hours teaching can be provided.
- Enrichment, updating, guidance to additional learning resources, extension of existing courses.

- Interaction by students with scientists, experts, decision and policy makers, etc. to obtain multiple perspectives on an issue.

Apart from academic activities, teleconferencing is used for administrative matters such as:

- Problems solving and counseling on admissions, examination, status of courseware materials distribution,
- Guidance and advice on course content, expectations, assignments, grading, credits, etc.

Training and Development

Teleconferencing is used to provide training and staff development for capacity building in agriculture, health, nutrition, family welfare, etc. in remote rural areas. It reaches out to a large number of groups such as community workers, farmers, functionaries, etc. for extension activities, sharing of experiences, raising of issues, introducing government schemes, projects, mobilizing for activities and conducting campaigns

Teleconferencing has been effectively used for empowerment of women and local self-government bodies and training of grass root workers spread over large geographical areas.

Business/Corporate Communication

In the business and corporate sector, teleconferencing has been used for a variety of purposes such as organizing conferences, interviews for recruitment, project supervision, problem solving, consultations, information dissemination and training of the personnel. Education, training, instruction, information and counseling are merged resulting in an overall improvement in staff performance.

Governance

Using teleconferencing facilities, planners, administrators and executives can directly and simultaneously interact with people at all levels for speedy dissemination of policy, execution and monitoring the implementation of projects, problem solving, and providing expert consultations.

Professional and Medicinal Courses and Services

Medicine is an area in which teleconferencing is being increasingly used. Hospitals can provide medical services to remote areas with expert diagnosis and medical advice. Similarly, many professional training institutes are using the teleconferencing mode to provide quality teaching support to widely dispersed student community

6.3.3 Strengths of Teleconferencing

Teleconferencing offers a number of advantages to organizers, administrators, educators and learners.

- It provides learning to large groups, which are geographically dispersed.
- For organizations, delivery costs are reduced with resultant cost benefit in terms of time, traveling and spread of resources over large groups
- It makes the best use of the available resources by expanding the learning opportunity and taking the resources to the learners.
- It overcomes time or scheduling problems for the learners who can assemble at a learning center for a limited period only because of their full time or part time work, and family and community commitments.
- It can be designed to meet local specific requirements of training in terms of content, language and conditions.
- Training is of high quality and consistent. There is exposure to multiple perspectives from the primary

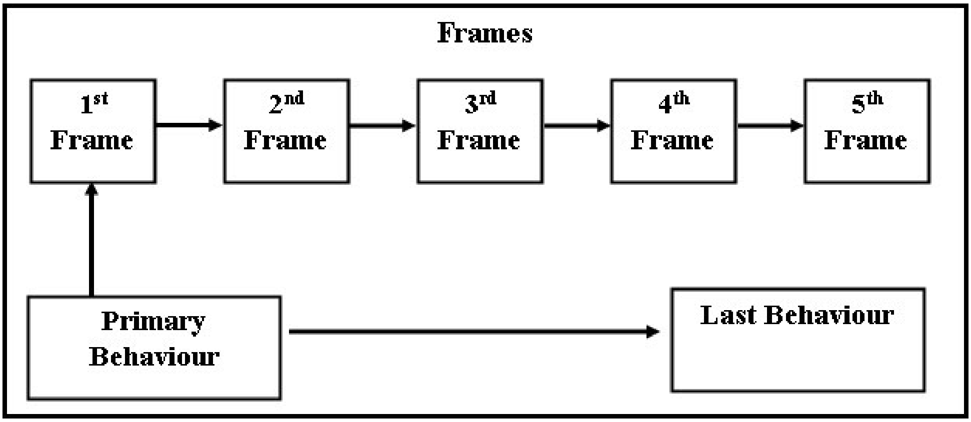
sources, and therefore as the input from the resource persons is direct, there is little loss of quality in transaction.

- There is greater appeal, motivation and retention of information as a variety of teaching methodologies are used.
- By using animation, graphics and other techniques, teleconferencing is good at showing processes for demonstrations and experiments, thereby concretizing learning.
- By conveying sights, sounds, and the spirit of the subject, it provides a more rounded view of an issue.
- It provides uniformity of training, which is interactive. On the basis of feedback, instructors can make appropriate shifts in the teaching strategies to meet learner needs.
- The element of interactivity in teleconferencing is encouraged through dialogue and by stimulating responses to situations and visuals. The opportunity of dialogue allows the learners to discuss, question, and challenge issues. Stimulating the learners to respond to situations and visuals leads to higher processes of learning. As the learners become familiar with the technology and its practices, their communication and learning skills are enhanced.
- Interactivity gives a sense of participation and an active environment for learning. The learners feel themselves to be a part of the 'real-life' learning situation, and though located on different sites they feel they are connected. Relationships are established as in a group situation.
- For the field functionaries in remote rural areas, it reduces the sense of isolation, encourages sharing of concerns and ideas, and helps solve their problems.

6.3.4 Programmed Instruction

A program is a subject which pupils learn. As far as programmed instruction is concerned, it is a new strategy of teaching. It is a device or strategy to control student's behavior and helps them learn without the supervision of a teacher. It is highly individualized instructional strategy for modification of behavior.

The programmed instruction is the arrangement of materials which are to be learnt by the pupils in graded steps of difficulty; it is in such a manner and sequence that it will result in the most efficient rate of understanding and retention. It is a method of giving individualized instructions in which the student is active and proceeds at his/her own pace. Physical presence of teacher is not essential in this strategy. Programmed instruction is a process of arranging the material to be learned into a series of sequential steps, usually it moves from a familiar background into complex and set of concepts, principles and understanding."



Thus, it can be concluded that the programmed instruction is an auto-instructional technique. The information is provided in small steps and each learner progresses at his/her own pace.

Origin of Programmed Instruction

- The origin of modern programmed instruction is from the psychology of learning and not from technology.
- It is an application of operant conditioning learning theory to teaching-learning situations.
- It has got a historical momentum, after the publication

of "The science of learning and art of teaching" article by B.F. Skinner. In this article, Skinner listed the problems of education system. He also discussed the potential of instructional programs to provide more feedback.

Characteristics of Programmed Instructions

As far as characteristics of programmed instructions, these are as follows:

- It is not an audio visual device. It is a part of education technology, i.e. instructional technology.
- It is a method of giving or receiving individualized instructions. It keeps in view their individual differences. The learner moves at his/her own speed.
- It clearly defines the entering and terminal behavior of the learners.
- It is not the solution of educational problems. It is a new instructional strategy for the modification of behavior of learner.
- It is systematic and sequenced.
- It cannot replace the teacher
- It provides immediate feedback to the learners.

Objectives of Programmed Instruction

The objectives of programmed instruction have been summarized as follows:

- To help the student in learning by doing.
- To provide the learners situation so that they can learn at their own pace.
- To help students learn in the absence of a teacher.
- To present the content in a controlled manner and in logically related steps.
- To help students in assessing their own performance themselves by comparing it with the given answers.

Assumptions Regarding Programmed Instruction

The programmed instruction has the following basic assumptions:

- The student has learnt micro teaching procedure.
- The student learns better if the content matter is presented in small steps.
- The student learns better if he/she is motivated to learn by confirming the responses.
- The student learns better if he/she commits minimum errors in learning.
- The student learns better if the sequence of content is psychological workable.
- The learning may be effective if the pre-requisites are specified on part of the learner.

Principles of Programmed Instruction

A good programmed instruction is based upon the principles of learning. These principles are based on psychological theories. There are five fundamental principles of programmed instruction. These are the following.

Principle of Small Steps: A program is prepared with large number of small and easy steps. The subject matter is broken down into a sequence of small step. A learner can take a step at a time. He/she has to read a small step by being active. Learning is better when the material is presented in small steps. It also reduces the rate of committing errors and encourages further learning.

Principle of Active Responding: Programmed instruction provides the information in the form of small steps and each step is required to be responded by the learner. Hence, the learner should be actively involved in the learning material. The learner does not remain passive because there is a need of active involvement in learning. The learner has to construct the response. It is an integral part of learning. The frames of program should also be designed logically that the learner shows interest in responding the frames.

Principle of Immediate Reinforcement: Programmed instruction involves giving immediate reinforcement to the learners. When learners response to the frames, they do not know that these responses are correct or wrong. By providing immediate reinforcement or confirmation to the response, the learner gets confidence. When the learner is reinforced for a correct response, he/she becomes repetitive for further learning. The learner learns best if his/her response is confirmed immediately. The confirmation provides reinforcement to the learner.

Principle of Self-Pacing: Programmed instruction rests on the principle of self-pacing. It recognizes the individual differences of the learners. This principle is based on the assumption that each learner can work each step as slowly or as quickly, depending upon his/her pace. Each learner is free to move according to his/her own speed, slowly or quickly as they like. Some can learn things at a quicker speed and may skip one or more frames, whereas others can go on slowly. It satisfies every learner's need.

Principles of Continuous Evaluation: The programmed instruction is based on continuous evaluation by recording the response of the learner. The learner leaves the record of his/her study for each step in response sheet. It helps to improve the quality of programmed material through checking the number of errors at each step. Also, the learner's progress can be evaluated by looking into the various types of response produced by the learner.

6.3.5 Satellite-Based Education

Satellite is a spacecraft that receives signals from a transmitter on earth and amplifies these signals, changes the carrier frequencies, and then retransmits the amplified signals back to the receivers on earth. The space age and launch of satellites started in 1957 with the launching of Sputnik by the former USSR. Since then, a number of satellites have been launched for various purposes like telecommunications, meteorology, remote sensing, disaster warning, defense and so on. Till date, thousands of satellites have been launched into orbit around the Earth. These originate from more than 50 countries. Moon is a natural satellite on earth and the rest are artificial (man made) satellites.

Educational media has been one of the major issues in contemporary world education. Radio and television broadcast has been extensively used for more then 75 years now in the developed countries. It is not only the television, radio or other small media like films or film stripes that are being used, but satellite communication for education is used world over. Though satellite communication is of recent origin, it has shown significant promises. It is an extremely resilient medium, and has been adapted in the business and industry. People world over are exposed to this media and witness its live demonstrations everyday.

Satellite Communication for education is used world over. Use of satellite and Interactive Television broadcasting are used in countries where geography and demography make it difficult to provide efficient formal education. Accordingly many innovations have been tried out. In the following section you will read about some experiments in education at international level. The experiments are not the only ones conducted by the respective countries but many more.

China

The Peoples Republic of China (PRC) launched its first satellite, known as China 1 or Mao 1 in April 1970. The launch made China the fifth nation with a space rocket. But China's space industry picked up its pace in 1980s and 1990s. In 1981, PRC launched three satellites to orbit with one rocket. The Long, March 2 rocket, which carried China's first homing satellite to orbit, was launched in 1975. During 1980s china sold commercial space launchers to foreign satellite owners. By the end of 2001 China had launched 50 satellites with 90 percent success rate. By 2008 China conducted 115 launches. These satellites are referred by different names in China. Like China's communication satellite is known as Dongfanghong (DFH), the oceanography satellite is known as Haiyan (HY-1 and HY-2) and so on. These satellites are used for communications and direct to home broadcasting, meteorological and oceanographic observations, navigation and positioning, disaster mitigation, and seed breeding. China has launched two manned spacecraft in 2005 and 2008 like USA and Russia.

Canada

Canada launched its first satellite, Alouette I in 1962. With the launch of its satellite, Canada became the third nation in 1962 to have built its own satellite for orbit. During this decade the other types of satellites launched were - Alouette – ISIS satellites and the Black Brand rockets. With these satellites, it was possible to deliver television programmes in English and French to the whole country. In 1967, Canada's space programme, refocused on satellite applications. In 1972, Canada launched Anik A1. NASA launched it on Thor- Delta launch vehicle and Canada became the first nation to have a domestic satellite in geostationary orbit Anik A2 launched in 1973 as a backup, and Anik A3 was kept on the ground till 1975. With the Anik A satellites, the quality telephone service and television programme reached every region in the country. Communications Technology Satellite (CTS) was an experimental programme jointly sponsored by NASA. The

Department of Communication (DOC) supplied the earth stations. Their earth stations were very flexible as they were quickly installed and were easy to operate by the users. Many educational programmes were telecast through Anik throughout Ontario. In 1979, the Government of Canada supported another series Anik B which was the second-generation satellite launched by Telesat Canada. Knowledge Network - an educational channel was set up in British Columbia. With these two satellites, Canada was seen as a world leader in the use of satellites for social services, especially for health and education. Presently the Anik C and Anik D series have been replaced by two Anik E's. In Canada satellite systems have been adapted to serve educational needs of many provinces. British Columbia, Alberta, Saskatchewan, Manitoba and Quebec each have a dedicated satellite channel and Ontario has two, one for English and second for French language. Medical specialists use television via the satellite. Night school students in British Columbia also receive lectures from Institute of Technology in Vancouver.

The Pacific Region

The Pacific Ocean is a region of various cultures and inhabitants. People in the region speak more than 1200 languages. Radio was the first media to go to the island territories. In the South Pacific region broadcasting was derived from British, French and American origins. The Pacific region has conducted many experiments in educational broadcasting particularly, educational television in American Samoa. It used NASA's satellite ATS-1 for educational experiments using low cost ground stations. The largest experiment in educational broadcasting in the South Pacific was the educational television in American Samoa. The experiment was to restructure the whole school system by means of television. Six VHF television channels station were installed with four studio production centres capable of producing 200 television lessons a week. Television was the major form of instruction for six elementary school grades and high school grades. Studio teacher presented television programmes. Teachers also prepared written materials for use in the classrooms. Teachers were producing 6000 live programmes a year. But in 1971 these programmes were cut to some 2,200 live programmes per year. However, parents, teachers and political leaders criticized the television programmes. In 1975, live programmings for schools came to an end and television was removed from school curriculum.

Africa

Most of the African states attained independence by 1960 when the educational facilities were inadequate and large section of the population was illiterate. Most of the independent African countries decided to give top Satellite-based Education priority to provide education for all. Broadcasting was thought to be the only possibility of reaching the unreached. The first radio broadcast station in Africa was started in Algeria in 1925 followed by Egypt in 1926 and Kenya in 1928. However, television was slow in making in roads in Africa. Number of countries did not have facilities for television broadcasting. Reasons were high cost of programme production, absence of electric power in rural Africa, etc.

In the last few years there has been a substantial growth of satellite based broadcasting in Africa. In 1995, South Africa launched the world's first digital direct-to-home subscriber satellite service known as Mindset Network to tackle country's educational and health care problems. Presently the channel is targeting grade 10, 11 and 12 learners and educators and focusing on Mathematics, Science and English. A time tabled curriculum based programme is broadcast in the morning. Late afternoons are allowed for school and home viewing. The broadcasts run from 8.30am to 5.30pm on weekdays. The network also provides the equipment, training and support for people to be able to access the content. The equipment includes a television, satellite dish decoder and video recorder. Mindset Network is planning to have two more education channels - one for early high school and other for early childhood development.

Australia

Australian Satellite system was started in 1985 with Aussat – 1 and 2 of the first generation of satellites. The downlink has two national beams and four spot beams covering different parts of the country. Aussat-3 have a beam with uplink and downlink capacity available for the Southwest Pacific region Television was introduced in 1956. Kindergarten Playtime, the first TV experimental educational programme was introduced in 1956. In 1960, a concerted effort was made to plan series of programmes for use nationwide. Production facilities for educational purposes were expanded in 1963 and 1964. Direct teaching programmes were introduced in Science and Mathematics to help implement new syllabi in these subjects and to overcome an acute shortage of Mathematics and Science teachers. By 1969, the Education Department of South Australia and Queensland had begun to equip their schools with video recorders. By 1972, 90 percent of all Australian schools were making regular use of schools television programmes. The school broadcast consisted of wide range of both enrichment and subject specific programmes. Supplementary printed materials for both teachers and students were available for many of the radio and television schools broadcasts.

Among the other few experiments were the Queensland Government's satellite network 'Q-NET' which involves broadcast television to about 30 centres. This project looked into whether satellite communication is a costeffective means of providing postgraduate vocational teaching and continuing medical education to general practitioners in Queensland. A twoyear pilot phase of the project provided an in-service course to Pre School to year three teachers to help them develop children's reading and writing abilities. There are different types of earth stations: Interactive, which can receive television broadcasts and data and voice transmissions as well as transmit data and voice, television receive only (TVRO) which can only get television, data and voice but cannot transmit signals to the satellite. This was the first Telecourse development in Australia.

United Kingdom

BBC has a Broadcasting Research department, which was set up as early as 1936. It provides audience reactions to both TV and radio output. The research findings are used for strategic planning. UK has other alternative broadcast services like Channel Four, Central Independent Television and The Leaning Channel (TLC) which broadcast ITV programmes. The schools in UK can use either BBC or any other service provider. The details of all these channels are not described here but the important point is that in UK there are educational channels other than BBC, which broadcast educational programmes. The Open University in Britain established in 1971 broadcast lectures on BBC television. The programmes are broadcast on the BBCs national radio and television networks. The programmes are for undergraduate or non degree programmes and have a reach of more than ten million viewers. These programmes cover a wide range of subjects and are filmed all over the world. These television programmes are found to be effective and useful. The Joint Information Systems Committee (JISC)'s UKERNA 2-way Satellite Access Trial project is a two-way satellite Internet access. This pilot project was from November 2002 until the end of April 2004. It involved 17 higher or further education sites in the UK, all located in areas described as being rural and/or remote. These areas could not receive ADSL or Cable Modem broadband services, and included locations in the Highlands and Islands of Scotland, Cornwall and Wales. The aim of this trial was to investigate how far satellite telecommunication technology can contribute towards solving connectivity and access problems in remote and currently undeserved areas. Seventeen off-campus learning centres, off-campus sites and individuals (staff) were equipped with small VSAT-based systems and services to assess the feasibility of broadband satellite as a technology for Internet access. Two satellite service providers, representing three major satellite telecommunications technology providers, have taken part in this trial. The user group is divided into two application areas, one focusing on connecting off-campus learning centres, small user-groups and individual users (1 to 4 PCs per site), the other focuses on providing Internet connectivity for larger sites (10 PCs per site). The aim of the trial is to evaluate to what extent twoway satellite can effectively provide last-mile broadband connectivity to those Joint Academic Network (JANET) Connected Organisations in the UK. The results of the trial evaluation show an increasingly satisfied user base, certainly after initial network problems have been ironed out. This has resulted in a take up of over 50% of the commercial VSAT offer within the pilot user group. Although the usage is relatively small (traffic rarely exceeds 1 GB per month per client station), users acknowledge the fact that in their location, they do not expect an alternative access method within the foreseeable future. Moreover, this technology is providing them with an opportunity to adopt innovative eLearning and teleworking methods that were simply not possible with the previously available access provision.

Japan

Japan's space programme began in 1955 with the contribution of a handful of university professors. In 1970, Japan became the fourth country to launch its own satellite to orbit, after the USSR, the United States and France. Japan enjoyed a 100 percent success rate with its rockets though Japan's space agency — the National Space Development Agency (NASDA) had its first failure in 20 launches in 1989.

6.4 OPEN EDUCATIONAL RESOURCES: CONCEPTUAL ISSUES

The term open educational resources first came into use at a conference hosted by UNESCO in 2002, defined as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for noncommercial purposes". The definition of OER now most often used is: "open educational resources are digitized materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research". To clarify further, OER is said to include:

Learning content: Full courses, courseware, content modules, learning objects, collections and journals.

Tools: Software to support the development, use, reuse and delivery of learning content, including searching and organization of content, content and learning management systems, content development tools, and online learning communities.

Implementation resources: Intellectual property licences to promote open publishing of materials, design principles of best practice and localize content.

A closer look at the definition shows that the concept of "open educational resources" is both broad and vague. A wide variety of objects and online materials can be classified as educational resources, from courses and course components, to museum collections, to open access journals and reference works. Over time the term has come to cover not only content, but also learning and content management software and content development tools, and standards and licensing tools for publishing digital resources, which allow users to adapt resources in accordance with their cultural, curricular and pedagogical requirements. Figure 1 illustrates the different elements of OER.

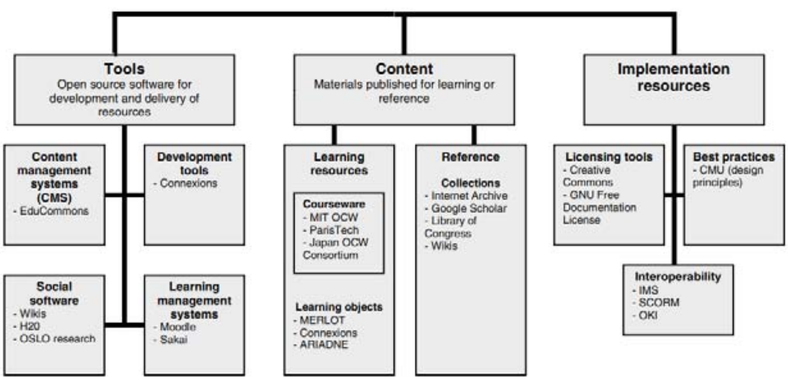


Figure 1: Open educational resources: a conceptual map.

6.5 IMPACT OF SOCIAL ISSUES IN EDUCATION

In such competitive world, education is a very significant tool for every person to succeed in life. Education is must for both women and men equally as both together make an educated and healthy society. It gives many purposes to the lifelike as the development of the personal advancement, increases social status and health.

Much of what goes on in society disclosures into the school method, impacting students and their learning and knowledge experience. School systems should identify what kinds of social problems are of main anxiety, and educate students regarding ways to fight them. Parents and teachers can cooperate on plans for reducing social issues in schools.

Classroom Racism

Racism is a social issue that is present in every aspect of society, from business atmospheres to schools. That this problem has worked its technique into classrooms is proofed by biased peers full of prejudiced notes towards classmates of minority backgrounds. However teachers can ban language conflicts at school, racism might continue to survive if parents don't also assist to accurate the preconception behaviors of their children in the home. Though, if students are learning their racist views & comments from their teachers, parents will not be capable to depend on parents to assist resolve the problems.

Ethnic Issues

Children have its place in certain ethnic groups, are incorrectly evaluated as being slower learners when measuring up to other competitions. This is, obviously, not true for the reason that one's learning capabilities not straightforwardly connected to their customs. Though by reason of social or even geographical aspects, students from certain ethnic groups lack sufficient disclosure to sources of learning. It puts the students belonging to them at risk of increasing low self-esteem.

Unequal Opportunity

Within the realm of judgment is the social issue of unequal education opportunities for individuals who come from smaller backgrounds. Students who belong to this demographic risk lost out on the similar stage of educational excellence as middle to higher class students of non-minority backgrounds. The social problem here is that the offers disproportionate opportunities and education system has inequities based on cultural affiliation and income level when in an ideal world, all students should have exposure to an equal education.

Economy

The economy plays an important part in social issues that affect students. As children become older, they begin to notice the financial burdens that their families experience. In an economy, it can be hard for families. Subsequently, some high scholars drop out of school so that they can assist support the family financially. Students who belong to deprived families are most probable to attend public schools. These schools are not as sound prepared with technology as a private school. This then automatically lay them at a difficulty when judge against to other students who go to private schools.

Cultural issues

Students belonging to migrant families may not be sound proficient with the English language. This makes an obstacle to contact students and teachers. Such students are not capable to get an accurate education.

Ethical Issues

There are certain extra ethical issues in education which have an effect on students. For instance, whether to permit mobile in school or not, should school uniforms be made compulsory, etc.

Gender Issues

Social problems in education are the degree of difference treatment delivered on the cause of gender. In certain parts of the society, girls are delivered few opportunities for studying, in comparison to boys. Expectations from girls to achieve high in studies or study further less.

Substance Abuse

Substance abuse and habits have become an epidemic. Many students have the way into addictive substances, alcohol, and drugs. The use of such substances leads to trouble in the type of criminal behaviors, violence and a withdrawing interest in education. This social issue can be controlled through the supportive environment for students, both at school and home.

These are some of the social issues that impact education. It plays a great role in a student's education. The social issues can impact education positively as well as negatively. So, students and teachers should be careful towards these social issues.

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CHAPTER 7

RECENT TRENDS AND ISSUES IN EDUCATIONAL TECHNOLOGY

INTRODUCTION

Technology plays a significant role in the development of the educational process. Rapid development of information technologies has led to the birth of information societies and made it necessary for societies to follow it and adjust themselves to new technological advances. The rapid increase in information and the number of students have brought about several problems and these new technologies has taken a part in the development of educational process and the quality imposed into the educational institutions has become compulsory. The fast improvement in Science and technology is affecting educational and social system as much as affecting the economical system. Technology use in education gives opportunity to the students in order to produce projects by working with together in an environment which supported with the internet and mobile learning devices. Goodyear defines at that type of learning, networked learning, cooperative learning, knowledge and communication technologies are the ways of communicating with student-student, teacher- student, learning sources and between the learning institutions Different terms are used to indicate what students need in their educational environments, like digital literacy, technological literacy, and 21st century skills. However, education leaders, nationally and internationally are pointing to a new common definition of the students need as Information and Communication Technology (ICT) Literacy. It is argued that, empowering students with ICT literacy skills enables them to think critically, analyze information, communicate, collaborate, and problem-solve. Educational technology is used to increase the efficiency of education in educational settings. Computers and related technology are viewed as the future of teaching and learning and also as a powerful technological machine to promote development of learning. Computers are able to create a more attractive and effective learning environment.

Technology has many different effects on education specifically in enhancing students learning. When technology and appropriate teaching methods are integrated in teaching and learning, a positive impact may be observed in both the cognitive and affective domains.

Educational technology encompasses environmental organization or the design of the teaching environment for detecting student behaviors the determining of certain educational situations and gaining in experiences. Of late, educational technologies have been defined as the recent developments in educational instruments and other new electronic technologies. Roblyer and Edwards suggested that there are important reasons for teachers to use technology in education: motivation, distinctive instructional abilities, higher productivity of teachers, essential skills for information age, and support for new teaching techniques.

Citation analysis has been used in the social sciences for investigating the research contributions of individuals, institutions and professional journals. It allows researchers to examine how frequently a work has been cited by other authors, providing one measure of the influence of a writer or of a particular article. The use of citation analysis as a research tool began during the mid-1950s, when Garfield proposed citation indexing.

Technology is perhaps the strongest factor shaping the educational landscape today. Many school districts are showing support for increased levels of technology in the classroom by providing hardware such as tablets and computers, enhancing internet connectivity, and implementing programs designed to improve computer literacy for both teachers and students. Although teachers generally appreciate the benefits of educational technologies, they often find smooth and effective integration of new educational technologies challenging. From acquisition of new technology equipment to adaptation of curricula and teaching techniques to incorporate new educational tools, technology integration presents significant challenges to educators at each level of school systems.

7.1 PROGRESS AND PROBLEMS IN EDUCATIONAL TECHNOLOGY

Educational technologists have promised that great advances and improvements in learning and instruction would occur on account of new and emerging technologies. Some of these promises have been partially fulfilled, but many have not. The last decade of the previous century witnessed the consolidation of new approaches to learning and instruction under the banner of constructivism. This so–called new learning paradigm was really not all that new, but renewed emphasis on learners and learning effectiveness can clearly be counted as gains resulting from this constructivist consolidation within educational research. At the same time, technology was not standing still. Network technologies were increasing bandwidth, software engineering was embracing object orientation, and wireless technologies were extending accessibility. It is clear that we can now do things to improve education that were not possible twenty years ago. However, the potential gains in learning and instruction have yet to be realized on a significant global scale. Why not? Critical challenges confront instructional designers and critical problems remain with regard to learning in and about complex domains. Moreover, organizational issues required to translate advances in learning theory and educational technology into meaningful practice have yet to be addressed. The current situation in the field of educational technology is one of technification. New educational technologies are usable only by a scarce cadre of technocrats. Constructivist approaches to learning have been oversimplified to such a degree that learning effectiveness has lost meaning. As a consequence, education is generally managed in an ad hoc manner that marginalizes the potential gains offered by new learning technologies.

Educational technology is rich with speculation about dramatic improvements in learning and instruction that will be realized through innovative applications of new technologies. History tells a different story. Thanks to such technologies as interactive simulations, the Internet, streaming media, and virtual reality, educational technologists can do amazing things. Educators can represent a great variety of complex phenomena in school settings that would have previously required expensive field trips and only limited opportunities for interaction. Educators can apply voice recognition to foreign language training and use conversational interfaces so that learners can practice speaking skills in realistic settings. Educators can record and replay noteworthy events. Rich digital resources exist for nearly every topic of concern, and technology development continues at a mind–numbing pace.

In the 1980s it was predicted that intelligent tutoring systems would produce dramatically significant improvements in learning, similar to the two–sigma effects that Bloom had documented for some one–to–one human tutoring situations. Such improvements did not occur. What did materialize were somewhat less significant improvements in a few very well–defined learning situations and the realization that it was extremely difficult to create a dynamic computer model of what a learner understood about a particular subject at any given moment in time.

In the 1990s it was predicted that distributed learning and tele–collaboration would make classroom teaching and teachers obsolete. This did not happen. What has materialized is the realization that collaboration at a distance is often quite difficult and challenging. We have also realized that the role of the teacher is not likely to be eliminated by technology. Rather, the role of teaching in technology–intensive settings is more difficult and more challenging than ever before. Only a rare few master the knowledge and skills required to effectively integrate technology into everyday learning and instruction. Yet we continue to invest significant resources into educational technology. Why? Many people have an implicit faith that technology will generally make things better, including education. Such faith is ill–founded. It is true that technology has been a centerpiece in many instructional systems and learning environments. However, technology is not what learning is about. Learning is fundamentally about change. Most learning theorists acknowledge that learning is marked by changes in attitudes and abilities that tend to persist over time. Technology can certainly be used to promote learning. Technology can also impede learning.

Advances in Educational Technology

One can arbitrarily date the history of modern educational technology with the use of radio to deliver instruction in the early part of the 20th century. There were successful uses of radio–based instruction in Australia, Canada, the USA and elsewhere. Using radio for teaching in most instances was driven by the remoteness of learners and the ease with which radio could reach those learners. As with subsequent technologies, when radio–based instruction was introduced, there was much enthusiasm about its potential to improve learning on a global basis. What occurred was somewhat less dramatic than what was promised.

Such promises of dramatic improvements in learning, coupled with the ability to reach learners neglected due to remoteness or resource constraints, were repeated with the advent of television and then again with regard to the introduction of personal computers. These promises of technology–transformed learning and instruction exist now in conjunction with networked learning environments and highly interactive multimedia that are widely accessible and affordable.

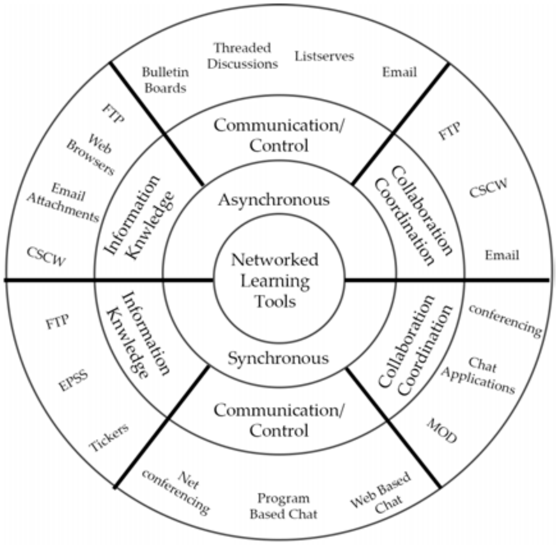


Figure 1. Networked learning tools

Networks bring learning support and instructional materials to learners who can potentially access materials anywhere, anytime. Interactive multimedia provide a level of manipulation that can engage learners and activate exploratory learning. This is accomplished by using a number of tools ranging from simple email to computer–supported collaborative work (CSCW) environments. It is possible to use networks to share web–based resources and deploy powerful electronic performance support systems. While developments in networked and collaborative settings have received a great deal of attention in the literature, there is not nearly as much research on the changing nature of instructional design due to such systems. Moreover, there is little consideration given to the demands placed on designers to make effective use of these technologies or of the ability of teachers to master the requisite knowledge and skill to effectively integrate such tools into their everyday teaching.

It is not rare or surprising that new tools and technologies introduce new challenges and problems. What is noteworthy is the pace of development in educational technology and the need for teachers and designers to keep up with that pace. The tools and technologies indicated in Figure 1 are not by any means exhaustive. The tools and technologies associated with interactive multimedia are similar in number and complexity. How can teachers and designers maintain their knowledge and skills with regard to educational technology? As teachers and designers fails to keep pace, educational technology becomes more and more a domain of special expertise. As a consequence, educational reform and progress fall into the hands of technocrats.

The term technification is introduced to indicate a domain largely controlled by and accessible to only those with special knowledge and skill. Before examining the technification of educational technology, I shall first review what has been called the new learning paradigm and indicate some specific challenges for instructional designers associated with these changes.

Reconstructing Learning

In the midst of the many promises and problems associated with using technology–based resources in teaching and learning, there are conceptual issues to confront. One such issue concerns the nature of learning. Some suggest that a new learning paradigm is emerging on account of new technologies. While it is true that technology has been a centerpiece in many instructional systems and learning environments, technology is not what learning is all about. As noted earlier, learning is essentially about change. Learning involves changes in attitudes, beliefs, capabilities, knowledge structures, mental models, and/or skills. When these changes have been observed and are believed to be stable (likely to persist for some time), it is reasonable to say that learning has occurred. The definition of learning is not changing. Learning is still essentially about change. Rather, what is changing is how to facilitate and support effective learning, especially with regard to new technologies and complex subject matter.

It is fair to say that the conceptualization of learning activities (not learning itself) has undergone dramatic change in the last twenty years or so. Part of this conceptualization is renewed interest in how peers contribute to and support learning, especially with regard to subjects that are complex and challenging from the learner's perspective. Once interest is broadened from an individual learner to a group of learners (a learning community), the need to introduce new assessment methods arises. Action research and activity theory provide new perspectives and methods. However, the use action research and activity theory is not yet so rigorous nor so widespread as to provide a solid basis for an improved understanding of the conditions that facilitate learning in various circumstances. This situation is likely to improve with time.

A large part of the so–called new learning paradigm involves a shift from what has been called an atomistic perspective to a more holistic perspective. The atomistic perspective emphasizes individual units of learning (specific and discrete conditions, methods, and outcomes) and treats learners in an isolated manner (focusing assessment on individual learners and evaluation on aggregates of individual assessments). This atomistic perspective can be contrasted with what Spector called an integrated and holistic perspective. The holistic perspective views a person as a member of a society and as a member of various language communities and communities of practice. The overall goal of a language community typically involves a strong survival element, often not made explicit. In this perspective, living consists of working and learning, which are viewed as collaborative efforts toward commonly held goals. This social perspective and the realization that learning is often aimed at integrated collections of human activities comprise a holistic perspective of learning. From the holistic perspective, learning is ultimately aimed at improving the understanding within a community of various phenomena and situations; learning is not merely about recalling specific facts or solving specific problems and learning assessments should reflect this.

There is much to celebrate in this constructivist consolidation of learning research, some of which has been made possible by technology. However, this new learning perspective does not eliminate the need for instructional design. Rather, this enriched view of learning makes the task of designing meaningful learning experiences more challenging than ever before. Moreover, the technologies that potentially enable the realization of learner-centered environments depend on expert knowledge of systems (computer systems, instructional computing systems, knowledge management systems, etc.) not typically found in teachers and rare enough among instructional designers.

Challenges for Instructional Designers

Jonassen and colleagues argue that the new learning paradigm is predominantly and fundamentally constructivist, as just described. Resnick and colleagues argue that the new paradigm is fundamentally social, as in socially shared cognition. These views are generally compatible and are espoused by many other prominent educational researchers. The reality that these changes represent for the designer is not revolutionary since the fundamental definition of learning as involving changes remains intact. However, these changes do add to the complexity of design. For example, it is not simple to decide to what extent an open-ended, exploratory environment is likely to be effective with specific learners for a given subject, or to compare that alternative with a guided discovery approach.

Deciding how to effectively implement and support socially situated learning activities is likewise complex. Balancing costs and expected outcomes of alternative solutions is no simple matter, especially since newer approaches have little effectiveness data on which to build realistic expectations or construct realistic cost–benefit analyses.

Let us focus on just the communication, coordination and control aspects of new information technologies, since they might be regarded as especially prominent. Information is basic to nearly everything that occurs in a technology–facilitated environment. Information is being passed along and processed in a variety of ways at different levels. As computer and network systems have advanced, it became obvious that databases (structured collections of information) were vital. Even more useful are knowledge management systems that provide rules for accessing, browsing, interpreting, interrelating, modifying, reusing, and extending the information in a database. Associated with each major technology generation are new and more complex tasks for instructional designers, as suggested in Figure 2.

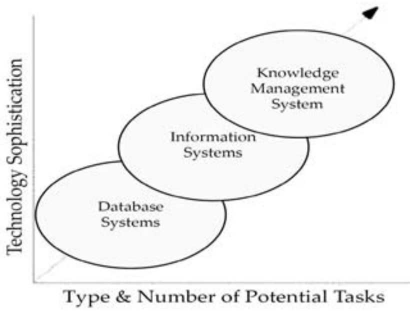


Figure 2. Networked system sophistication.

Information and the means to structure and manage that information is required in order to have an effective system. When learning tasks are complex and socially situated, which is the case more and more often, support for collaboration and cooperation on a variety of learning activities is required. Most often, that support is related to the coordination and communication functions of the system. However, as tasks and activities are distributed, it becomes important to maintain some kind of control to insure that work is not unnecessarily duplicated or lost, that appropriate information is accessible and shared, and that project deficiencies are identified and repaired. Instructional design in such an environment is a complex and ill–structured process. Apart from the complexities introduced by technology, there are a diverse set of problems and considerations that comprise instructional design. One aspect of instructional design complexity concerns the variety of tasks to be accomplished. An instructional designer may interact with managers, with people performing training tasks, with subject experts, with system specialists, and so on. A designer proposes solutions and defends project plans, manages a project, chooses media, develops storyboards and other products, conducts evaluations, and so on. It is rare to find one individual who can perform all of these different activities or who would have the time to perform them all on a large–scale effort or for several projects. As project complexity grows, so does the need to collaborate and to coordinate activities.

Another aspect of instructional design complexity concerns the ill–structured nature of goals and requirements. It is rare to find a client who has well–articulated goals and requirements for a learning environment or instructional system. It is much more common to encounter a goal such as "put these courses on the web." The designer who confronts ill–structured goals confronts a negotiation task that is dynamic. Goals and requirements are likely to evolve as the project proceeds. Managing activities in the face of changing requirements is a complex and challenging task. Effective management in this context requires effective communication, coordination and control processes.

Associated with this particular challenge is the negotiation of how best to achieve goals and requirements. There are almost always alternative ways to implement a learning environment. Costs are usually a primary concern, although contexts, learning outcomes and organizational impact are of obvious importance. Again it is difficult to imagine any one person mastering such different areas of expertise. It is especially rare to find a well–developed and documented cost–benefit analysis for a technology–based educational project. At the course or lesson design level, instructional designers confront the issue of distributing specific course events and activities in a variety of settings versus putting the entire course online. One of the big lessons learned over the years with regard to educational technology is that it is not likely to be effective or efficient to simply replace one delivery medium with another without consideration given to particular learning activities and situations. It is tempting to think that one can replace a less experienced teacher with a video tape, or that one entirely replace classroom instruction with a computer–based tutor. The real complexity for designers arises when they try to match subject matter with learner characteristics and appropriate instructional methods. New technologies offer designers many options for combining instructional contexts. The instructor–led model is giving way to hybrid course designs that include a combination of technology–mediated events and traditional classroom events. Distributed forms of interaction, including virtual communities and tele–mentoring, are feasible. These types of interactions allow for a community of learners to exchange information, communicate about ideas and problems, and collaborate in developing experimental artifacts outside the classroom. Learning can be embedded in the workplace. Distributed learning can encompass a wide array of scenarios, which can potentially involve the use of many different technologies and learning contexts. This certainly adds significantly to the complexity of design

Collaborative software that allows users to easily communicate, coordinate, and collaborate are recent innovations. Previous developments lead to the development of new forms of CSCW. Internet tools (e.g., email and electronic bulletin boards) are useful for communicating among team members but using these tools to distribute and collaborate on documents is burdensome. Using these tools to edit documents can be confusing and time–consuming. For example, if the owner of a document emails it to 10 team members, then 11 versions of the document now exist all with the potential to contain edits, and rewrites. If a document is sent to users in a linear manner, as with paper documents, one user can stop the entire process. The creation of web pages to share information can also be cumbersome, forcing teachers and designers to create platform documents and requiring users to install additional software. Tools such as Xerox DocuShare and SevenMountains 7M Integrate allow users to employ the software applications that they already use. In addition, these provide version control and automatic tracking of updates, ant that removes the burden of document control and coordination from a project manager. Such powerful CSCW software allows for geographically separated team members to contribute to a project, so collaborative instructional design can become a reality.

Whenever newer information and communications technologies have emerged, the trend has been for those technologies to find their way learning and instruction. When the Internet exploded, the educational focus became providing distance learning using the Web. Not much thought was given to the design aspects of the instructional materials or to the entire learning environment itself. One can use new technologies to support instructional design and recent work in the area of web–based learning reflect a much more mature use of the web to support learning and instruction. Experience with tools like Xerox's Docushare and SevenMountains 7M demonstrate that we can also use CSCW tools to support the collaborative design of instruction. Such tools provide the new dimension of distributed support for collaborative instructional design. This is likely to have an impact on how instructional designers work. Organizations effects and effects within higher education of such new technologies remain somewhat unclear and not clearly associated with causes.

Technification

The problems that can occur when introducing technology into teaching and learning are significant. There are problems concerning the preparation of teachers and learners. These are more or less well documented, although the pitfalls due to lack of teacher training and student preparation are often overlooked in the haste associated with acquiring and implementing new technologies. Institutional pressures are many and complex. Different interest groups lobby for particular technologies. Restrictive institutional practices and short–sighted policy planning can result in wasteful investments and in the alienation of constituencies. More important, perhaps, is the degree to which educational technology has become the domain of those with special knowledge and skills. If one compares current technologies with those of the first half of the last century (i.e., radio and television), one can say that while producing radio and television broadcasts requires special expertise, this was accomplished with close coordination and involvement of teachers and instructional designers. It is now more common to find teachers reporting that they feel alienated from educational technology and there are many reports of a paucity of well–trained educational technologists. The outcome of this situation is that it often happens that educational decisions are made by those with technology expertise, leaving many teachers and designers and parents outside decision–making channels.

Moreover, the social and global implications of the digital divide (of which technification is but one symptom) are much discussed but not especially well understood. Many who are conducting research in the area of technology–based learning are very optimistic about the potential to confront the digital divide. However, many countries still lack basic infrastructure to even advance to a stage where technification becomes a problem. It appears that the divide is widening in the area of e–commerce. Investments of the European Commission, the United Nations, the World Bank, and many national research foundations in spreading e–learning to developing countries may eventually help in this regard. However, when required infrastructure is lacking, such efforts only serve to highlight the digital divide.

One change due to networks and interactive multimedia involves the blurring of the distinction between learning and working. Individuals may shift thoughtlessly from performing a work activity into a learning mode through a system–initiated help environment. Workers may put one task on hold while taking time out for a tutorial. Individuals may unwittingly activate background agents to gather information on selected topics which are then pushed into windows that appear in the user's desktop work environment. Workers may shift from working alone on an isolated task to seeking guidance and advice from a community involved in similar activities. Such technology–enabled opportunities generally require an appropriately trained cadre of teachers and designers or else they become the province of the technology–informed and technification sets in. Ironically, new technologies are touted as democratizing education, especially the Internet. The reality of technification is that technology–based education may become far less democratic than traditional classroom–based education.

In short, changes more revolutionary than constructivism are underway. These changes most definitely make instructional design more challenging than ever before. These changes can be found in the workplace with adult learners. They can also be found in schools with learners of all ages. Organizational changes are afoot, in part in association with the phenomenon of technification just described. One set of changes involves attitudes with regard to workplace learning. This concern is partly a result of the growing support for lifelong learning and it is partly a result of emphasis on developing a genuine learning organization. The complexity that these changes produce for designers and teachers include the requirement to take a much larger and longer perspective on learning and instruction than the traditional focused perspective of designing and teaching a course. An example of such a longer–term perspective is the notion of designing for re–use. This notion is now the province of educational specialists who are familiar with knowledge and learning objects and associated metadata tagging mechanism. The interested reader can explore the extensive literature on SCORM – Shareable Courseware Object Reference Model Initiative – and ADL – the Advanced Distributed Learning Initiative – efforts initiated by the US Department of Defense and Office of Science and Technology Policy. The advantage of knowledge tagging and instructional metadata is that they allow material stored in digital repositories to be found and reconfigured for specific learning needs. Such use was demonstrated about 15 years ago with the hope that this technology would further democratize technical training. However, there is now 15 years of evidence that metadata tagging and reusable knowledge objects remain the purview of technocrats.

Indeed, within the domain of software engineering it was argued that object–oriented programming would eventually make it possible for domain specialists to describe systems so that computer code to support specific requirements could be automatically generated, at least in part. This was seen as a way of extending the programming language further from machine level toward the level of describing problems in everyday language. Object orientation was supposed to revolutionize programming and make it in principle for most technical specialists to be programmers. This has not happened. Quite the contrary, reusable software objects are not generally accessible outside small communities of specialists. It is not surprise that a similar development has occurred with regard to knowledge objects. This is but another example of technification. It may not be avoidable and it is not necessarily undesirable, so long as progress does occur to extend the potential gains to larger communities of users.

7.2 CHALLENGES OF BLENDED EDUCATIONAL TECHNOLOGY

Everyday life has experienced changes and educational settings are not exceptions. This change is more remarkable and rapid with the advent of modern technologies. Learners, for centuries, have experienced various instruments and method to learn more effectively and rapidly. Teaching in educational settings may be influenced by diverse factors. One of these factors is employing modern technologies in teaching environments. Modern technologies and Information and Communication Technology (ICT) provide extraordinary infrastructure to deliver the knowledge in numerous ways, in different regions with different learners. Information and Communication Technology (ICT) has great impacts on human life from various perspectives. People communicate with each other via new technological devices such as mobile phones, social networking, texting via the internet, as well as visiting various webs without limits. Education world is no exception. The use of ICT in teaching and learning might have a positive effect on learners' academic achievements. Many action plans were adopted at the national and international levels, and considerable investment was made for ICT in teacher education. Most teacher education programs have been redesigning their curricula in order for prospective teachers to become competent users of new technologies when they become teachers. One of the consequence of modern technology was the advent of new filed in education that was Mobile Assisted Language Learning (MALL).

7.2.1 Mobile Learning or Mobile Assisted Learning (MAL)

Employing technological devices in learning improves the quality of education. Social network is a new and updated trend in the technology world that has been referred to networked tools that allow learners to communicate, interact and share their ideas and interests with each other. Social networks such as WhatsApp have opened up new interaction opportunities among teachers and learners. The use of social networks is becoming popular in everyday communication. It is even used for collaborative learning tasks, especially in language learning. Contemporary educational policy, curriculum designing, and instructional pedagogy have been profoundly affected by impressive new global information and communication technologies. New modern competencies include the ability to collaborate with others on processes of problem-solving, textual coconstruction, negotiation, and cooperative production and presentation even when working in different locations and connecting only by these new technologies. Like other fields of study, teaching have also influenced by new teaching sources and software. They stated that wireless technologies such as laptop computers, mobile phones, especially smart-phones, create a revolution in education that transform the traditional classroom-based learning into lifelong learning.

Increasing access to internet resources, learners have an affluence of authentic oral, written, linguistic corpora and concordant programs that help them solve their problems. Guy declared that the field of mobile learning is relentlessly advancing and there are some research studies that explore the advances of mobile technologies in learning environments unfold on a regular basis and there have been several attempts to classify the definitions of mobile learning used in the literature into a comprehensive framework, e.g. Traxler identified that three categories of mobile learning have been used in past literature. The first category was those early approaches to define mobile learning tended to focus on the nature of mobile devices, referring particularly to handheld or palmtop electronic devices. The next category exhibited a greater focus on mobility, but was largely still directed towards the mobility of the technology. The last category emphasized the mobility of the learners and the learning process. Farley, Murphy, and Rees stated that those definitions that incorporate a description of the technology are in danger of becoming obsolete as mobile technologies, mobile applications, and the capabilities of these technologies are changing in a rapid velocity. Although previous research studies pointed out several challenges in adopting E-learning environments in language education and in the EFL contexts, it has also identified numerous advantages of such technology-based instructions. Kukulska-Hulme and Shield demonstrated that Mobile learning (M-learning) or Mobile Assisted Learning (MAL) refers to any form of learning that happens when the learner is not at a fixed, predetermined location. In these kinds of distance learning, learners take advantage of the learning opportunities offered by mobile technologies and are acknowledged as an interactive type of technology-based instruction. The magnificence of this kind of learning is that learners are actively involved in learning activities and tasks by interaction and collaboration using a smart-mobile phone.

Mobile Assisted Learning (MAL) illustrated an approach to language learning that is enhanced through utilizing a mobile device. MAL is a subcategory of both Mobile learning (M-learning) and Computer-Assisted Learning (CAL). In MAL settings, learners are able to access learning materials, and communicate with their teachers and peers at anytime and anywhere. Hsu, Wang, and Comac expressed that the emergence of the third generation (3G) of mobile services was a revolution in learning and provided the potential of becoming widely used effective learning tools. Klopfer, Squire, and Jenkins declared five features of mobile technology that can increase educational benefits. These five features that are among the most important ones are as follows: Portability, social interactivity, context sensitivity, connectivity, and individuality.

Wong claimed that the most significant feature of MAL is that it is instructive and stated that in a mobile learning context, learners can take part in the interactive creation or analysis of internet video clips, or they can read or respond to blogs with English language users worldwide who share their interests and knowledge. There have been many research studies that were conducted on the applications of mobile phones and the potential of mobile devices for language learning environments in language learning and teaching in different contexts; however, there have been debatable claims about the effectiveness of smart-phones for educational purposes and their possible uses in English language instruction.

7.2.2 Social Learning, Social Networks, and MALL

With the blooming of the digital age in 1990s, teachers were among the first that found creative and innovative ways to teach through integrating digital technologies such as Internet and other similar digital technologies like E-mail, Web quest, instant messaging, and Web-based groups in their classrooms. The advances in technology and wireless networking expanded the opportunities of utilizing mobile phones in educational environments. Mobile phones and similar technologies suggest communicative language practice, access to authentic content, and task completion. A review has revealed that many researchers have highlighted the advantages of technology-based learning, especially mobile learning that is also called M-learning in the field of English language teaching. In fact, M-learning deals with concepts such as spontaneous, informal, pervasive, private, context-aware, and portable learning environments defined M-learning as the process of coming to know and the ability to operate successfully in modern and ever changing learning contexts and to know how to utilize modern technological devices. These devices have generated a branch of studies that relates to language learning and mobile technologies that are called Mobile Assisted Language Learning (MALL).

MALL allows learners to access learning materials and information from anywhere and at any time. Due to the wireless technology, smart-phones can be used both for formal and informal language settings where learners can access additional and personalized learning materials from the Internet. Indeed, learners do not have to wait for a certain time to learn or go to a certain place to learn what is prescribed to them. Smart-phones are excellent tools to assist learners to learn English vocabulary more effectively. Smart-phones are effective, especially for synchronous and asynchronous learning environments and for promoting learners' listening and speaking skills. They asserted that most mobile devices support collaborative speaking and listening activities successfully. Similarly, Chang declared that technologies and mobile devices facilitate the development of collaborative learning environments. Shen maintained that the opportunities that these devices offer to learners engaged them enthusiastically in the English language process. They added that social networking services such as mobile devices are high-quality means of enhancing learners' communicative competence. Mobile phones are widely used among young people for two important reasons: first, they are much cheaper and more available than other devices such as laptops and palmtops; second, they not only support the transmission and delivery of multimedia materials, but also support discussion and discourse, real-time communication, synchronous and asynchronous environments, audio capability, text and multimedia inputs; therefore, stakeholders and curriculum designers seek to use them in educational environments. These kinds of tools can be best put into practice in language teaching and learning contexts. For example, mobile phones can be used to send educational materials and contents to learners via Internet or in the simplest one in Short Massage Services (SMS). In contrast, some researchers contended that in an effective language setting, the emphasis should be on language learners, because employing such a novel and unproven technology in learning environments is a real waste of time and money than save them.

Another significant feature of modern technologies is their evolutionary role in social networking. Social networking sites like Facebook, twitter, and mobile social networks such as WhatsApp, Viber, and Line attract and support networks of people and facilitate connections between them. Gee called these social network contexts as affinity spaces, where learners acquire both social and communicative skills. While developing a range of digital literacy in these spaces, the youth involve in informal learning activities, creative and expressive forms of behavior, and seek new identities. Effective use of social networking and media technologies provide extraordinary opportunities for course designers and instructors to interject emotions in the online learning environments, thus providing learning opportunities for learners to make emotional connections with classmates just as they do in the real time out of the classrooms. Obviously, the key to a successful online learning course is to help learners find innovative ways to establish strong relationships with their peers and teachers, although simultaneously meeting their technology-based learning styles. These social media tools create a constructivist learning environment which allows learners to construct interpretations of their data and utilize their individual life experience while working as a part of a collaborative team. Learners can use social networking to create their own learning and social communities and their new identities. These online, social, and self-directed learning settings provide resources that enhance learners' engagement in the course. There are many social media tools that can be integrated into the curriculum to support learning and provide innovative and effective directions for content delivery in both synchronous and asynchronous language learning environments.

7.2.3 Massive Open Online Courses (MOOCs)

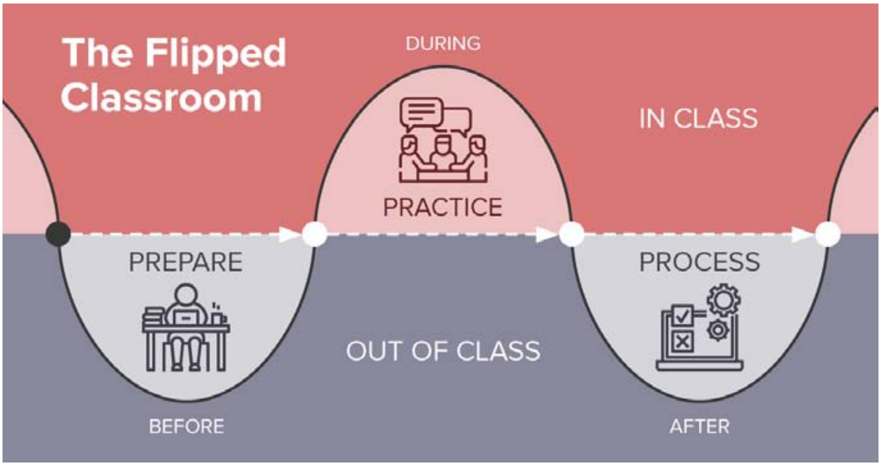
E-learning is a domain which covers the integration of Information and Communication Technology (ICT) in educational environments. The digitalization of educational resources and learning materials has enabled the re-use of these resources across countries and scholarly domains. These systems focus on online social networks to create connection and to improve engagement. MOOCs use social networks to create and sustain the social dimension of learning, and to enhance knowledge production rather than simply providing a platform for knowledge consumption. Yet very little is known about the types of messages that are appropriate to be shared between instructors and students in these communities. A Massive Open Online Course (MOOC) is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials such as filmed lectures, readings, and problem sets, many MOOCs provide interactive user forums to support community interactions among students and professors. MOOCs are a recent and widely researched development in distance education which were first introduced in 2008 and emerged as a popular mode of learning in 2012. The first MOOCs emerged from the open educational resources (OER) movement. The idea of Open Educational Resources (OER) has numerous working definitions. The term was firstly coined at UNESCO's 2002 Forum on Open Courseware and designates teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Open licensing is built within the existing framework of intellectual property rights as defined by relevant international conventions and respects the authorship of the work. MOOC was coined in 2008 by Dave Cormier of the University of Prince Edward Island in response to a course called Connectivism and Connective Knowledge. This course which was led by George Siemens of Athabasca University and Stephen Downes of the National Research Council, consisted of 25 tuition-paying students in Extended Education at the University of Manitoba, as well as over 2200 online students from the general public who paid nothing. All online students could participate through collaborative tools, including blog posts, threaded discussions in Moodle and Second Life meetings. Stephen Downes considers these so-called cMOOCs to be more creative and dynamic than the xMOOCs, which he believes resemble television shows or digital textbooks. Definitions and their features shed light on the differences between cMOOCs and xMOOCs.

In general xMOOCs have the following common design features: it is a specially designed platform software: it means that xMOOCs use specially designed platform software that allows for the registration of very large numbers of participants, provides facilities for delivering digital materials, and automates assessment procedures and student performance tracking. It has the opportunity to use video lectures: xMOOCs use the standard lecture mode, but delivered online by participants downloading on demand recorded video lectures. It has the infrastructure to use computer-marked assignments: students complete an online test and receive immediate computerized feedback. These tests are usually offered throughout the course, and may be used just for participant feedback. Alternatively the tests may be used for determining the award of a certificate. Another option is for an end of course grade or certificate based solely on an end-of-course online test. Most xMOOC assignments are based on multiple-choice, computer-marked questions, but some MOOCs have also used text or formula boxes for participants to enter answers, such as coding in a computer science course, or mathematical formulae, and in one or two cases, short text answers, but in all cases these are computer-marked. It has the potential to support different materials: sometimes copies of slides, supplementary audio files, urls to other resources, and online articles may be included for downloading by participants. Finally, learners can share comments and discuss in it where participants can post questions, ask for help, or comment on the content of the course. xMOOCs therefore primarily use a teaching model focused on the transmission of information, with high quality content delivery, computer-marked assessment (mainly for student feedback purposes), and automation of all key transactions between participants and the learning platform. There is almost no direct interaction between an individual participant and the instructor responsible for the course.

On the other hand, cMOOCs have a very different educational philosophy from xMOOCs, in that cMOOCs place heavy emphasis on networking and in particular on strong content contributions from the participants themselves. Zemsky has identified four key design principles for cMOOCs: the first principle is autonomy of the learner: in terms of learners choosing what content or skills they wish to learn, learning is personal, and thus there being no formal curriculum. The second one is diversity: in terms of the tools used, the range of participants and their knowledge levels, and varied content. The third one is interactivity: in terms of co-operative learning, communication between participants, resulting in emergent knowledge. And finally, openness: in terms of access, content, activities and assessment. Therefore, for the proponents of cMOOCs, learning results not from the transmission of information from an expert to novices, as in xMOOCs, but from sharing of knowledge between participants. cMOOCs therefore primarily use a networked approach to learning based on autonomous learners connecting with each other across open and connected social media and sharing knowledge through their own personal contributions. There is no pre-set curriculum and no formal teacher-student relationship, either for delivery of content or for learner support. Participants learn from the contributions of others, from the meta-level knowledge generated through the community, and from self-reflection on their own contributions.

7.2.4 Flipped Classroom

The flipped classroom describes a reversal of traditional teaching where students gain first exposure to new material outside of class, usually via reading or lecture videos, and then class time is used to do the harder work of assimilating that knowledge through strategies such as problem-solving, discussion or debates. The term flipped classroom was popularized by teachers Aaron Sams and Jon Bergman from Woodland Park High School, Colorado in 2007 in response to a realization that class time would be best spent guiding knowledge and providing feedback rather than delivering direct instruction. Zemsky reasoned that direct instruction could be delivered by recording video content for students to engage with before class and any time freeing up class time for activities that allow deeper exploration of content. Since then, the flipped classroom has grown in popularity in higher education as a potential model to increase student engagement, leverage technology and provide greater opportunities for active learning in class. Many educators argue that the flipped classroom model is not new, citing similarities with existing strategies where students are expected to prepare before class and engage in active learning in class. Structured pedagogies such as peer instruction, case-based learning, problem based learning and project-based learning are also underpinned by expectations that students should engage in set sequences of preparation and active learning to maximize the quality of their learning. There is no set formula for the designing the flipped classroom as it is very much dependent on your teaching and learning context.



7.2.5 Challenges and Barriers

Digital technologies caused many changes in distance education and this issue arise many debates regarding the effectiveness of such apparatuses in educational environments and their possible barriers. Hood, Littlejohn, and Milligan stated that the contextualization of OER has raised many concerns. The adaptation of open E-Learning systems for local contexts and cover local needs has often failed so resources are not used in many projects. Richter and McPherson claimed that Open E-Learning Resources are not meaningful to learners if the digital apparatuses and their practices fail to personify socio-cultural characteristics of the particular learning context. Similarly, Hsu and Wang stated that research efforts are directed to define how socio-cultural contexts influence the use and development of open E-Learning systems and resources. Greene, Oswald, and Pomerantz numbered three main barriers of conducting E-Learning system. The first one was the lack of resources to realize projects. The second one that they considered it as a subcategory is the lack of finances to invest on this cost effective solution of education. They believe that a lack of budget can impede the realization because investments are delayed. The third barrier, according to them, is the lack of time. Since employees have a high workload and they face difficulties to conduct learning sessions during work. Probably, this is the most important barrier of traditional educational settings and Imlawi, Gregg, and Karimi believed that this remains even in the modern educational environments. But Kent, Laslo, and Rafaeli believed that the main barrier can be political or the managerial coordination on a policy level. This barrier embraces the lack of regulatory frameworks for collaboration with other organizations and also the lack of coordinated implementation. According to Loizzo and Ertmer, the next barrier is the aspects of managerial culture. This one relates to established practices and administrative structures. Littlejohn, Hood, Milligan, and Mustain stated that other barriers can be the lack of leadership in the public sector, a lack of assigned responsibilities to organize learning programs, and a lack of tutors on the established platforms. In Kent words, the perceived technological fit of evolving technical systems is the main barrier in conducting such programs in educational settings. Generally, the barriers of technology support systems of education can be divided into two main categories: social barriers and technical barriers that are explained in detail in the following paragraphs.

Social Barriers

In the social dimension, the first aspect of challenges is the value of these systems on the national level. There are many differences in ethnic, national beliefs, and common understanding towards the features of these new settings. Luaces, Díez, Alonso-Betanzos, Troncoso, Bahamonde, and Factorization believed that the main barrier in the social dimension relates to individual concerns. A subcategory in this respect is socialization. The term stands for the fear to lose social contacts among colleagues when individual exchange during learning activities becomes technically mediated. Margaryan, Bianco, and Littlejohn observed that another subcategory in this regard is the concern about misunderstanding colleagues due to the loss of information richness. Individuals fear to get hold of experiential and tacit knowledge if collaboration shifts to virtual platforms. They added that another barrier is related to the characteristics and value of information and knowledge such as a lack of mutual trust which means employees have concerns about sharing information within the organization or they fear to lose their position; therefore, they are not apt to share what they know about best practices. Phan, McNeil, and Robin expressed that the quality of information is a subcategory of the social dimension. The subcategory lack of quality may appear to be related to the value of information; however, it is focused more on the nature of digital, online information.

Technical Barriers

The second main category of e-learning barriers deals with the technical dimension. Many researchers focused on this dimension and emphasized the challenges that they had in their studies, for instance, Watson, Kim, and Watson argued that the low availability of technology which embraces the subcategories shortage of appropriate infrastructure and software can be the main barrier in many contexts. To Wiebe, Thompson, and Behrend, the low quality of broadband connections which impede the inter-connectivity among administrations is the main barrier. Related to this aspect, a lack of common data references, definitions, and channels which impede a data and information exchange via technical means, concerns about security and privacy, restricted the access to online resources and platforms in technical manner are some other barriers that learners are faced with in their educational contexts.

However, Zhang expressed that many universities around the world focused on dual mode universities which are courses in both traditional face to face interaction as well as online or virtual courses. Nevertheless, in the education sector, developing countries are facing problems like lack of skilled teachers, educational infrastructure, and technology access to enhance the education at different levels. Barak believed that lack of resources including furniture, buildings, qualified teachers and learning material are the main obstacles in promoting open and distance learning.

7.3 TRENDS IN EDUCATIONAL TECHNOLOGY

Society functions much differently than it did prior to the advent of the digital revolution. New tools, ranging from social media to digital transaction management, have re-contoured the ways in which people interact and do business. The digital age also notably influences how we learn. In fact, the classroom has become one of the most rapidly growing markets for new technology.

Education technology includes many of the popular digital developments, such as the Internet of Things (IoT) and virtual reality (VR), but it has unique applications exclusive to the task of teaching. The education sector thus presents a significant opportunity for tech entrepreneurs looking for a promising market.As business leaders plan for the future, they should therefore consider the following educational technology trends:

1. Greater access to STEM materials

As technology has become increasingly central to all aspects of modern life, schools have put more focus on science, technology, engineering, and math (STEM) subjects. To take advantage of this shift, companies can develop engaging curriculum for robotics, coding, and programming.

2. Privacy for students

Cyber-security and digital privacy rank among the top concerns of all consumers, including consumers of education. As a result, there is a large market for improving the efficacy of existing products and creating new ones that will help manage student data and protect the privacy of these young individuals.

3. "Flipped learning"

A new approach to education is called "flipped learning," and as the name suggests, it involves turning traditional teaching methods upside down. In a "flipped" classroom, students take advantage of new technologies to absorb content at home through videos and other digital content and then complete their "homework" at school in small groups under the teacher's supervision.

4. Virtual education

Closely related to the concept of flipped learning is the idea of remote, or "virtual," education, which takes place outside of a physical school building. With this method, students complete courses at home using online content, including videos of instructors in front of an actual class. Another benefit of virtual education is that teachers can utilize video conferencing and social media technologies, as well as a variety of subject-matter experts to convey information and check for understanding.

5. Digital and media literacy courses

As students spend more and more time online, there is a growing need for a curriculum that teaches digital literacy — systems to help students harness the technological tools at their disposal. This includes developing guidelines for how to interact with others (for more than social and entertainment purposes) and how to process information they encounter online.

6. New utility for wearable technology

Wearable technology can help keep kids safe. Not only can these devices track the locations of students at school, but they can also monitor the whereabouts of campus visitors. These items can even facilitate paperless transactions in the cafeteria, thus reducing waste, and quite possibly, bullying and theft.

7. Game-based curricula

Schools are more frequently adopting game-based curricula as a means for creatively engaging students in their lessons. Many kids appreciate the challenge-reward concept of video games, and these digital platforms can incorporate a wealth of problem-solving and social skills.

8. Improved parent-teacher connections

As schools continue to incorporate Ed Tech into the classroom, communication between teachers and parents will flourish. Teachers will take advantage of programs that track assignments and report student progress to all involved parties. Therefore, businesses will do well to supply new and better communication channels.

9. Better open resources for educators

A vast array of educational resources exists for teachers looking to incorporate digital content into their lessons. However, many of these are of low quality. Tech developers, therefore, can profit from developing intelligent, polished, and well-researched digital materials.

10. AI and VR

Artificial intelligence (AI) has gained a lot of traction in the market recently. Tech companies can use this technology to provide educational facilities with virtual mentors and teaching assistants, as well as improved automated grading systems.

Virtual and augmented reality (VR/AR) is a popular gaming technology that entrepreneurs can use to enhance student learning. At some schools, students are already taking “virtual” field trips with a VR headset. Estimates project instructional AI and VR expanding into a multibillion-dollar industry in the near future.

11. Paperless textbooks

School districts today must decide whether print textbooks or tablets for every student are more expensive. Over time, the latter usually proves a better financial investment because schools can easily upload new and better classroom materials to the same devices, but they must spend thousands to replace outdated traditional textbooks.

12. Big data analysis

Just as big data helps businesses obtain a better grasp of their consumer base, it can help teachers learn more about their students. Technology-assisted learning can yield valuable information about how children learn and in which specific areas they are struggling. For example, a student might fully understand the material but get confused by the format of a test.

13. Social media

Educators have recently embraced the utility of social media for organizing group projects. Moreover, online conversations and homework-related hash tags can help students build their own peer community. It can also encourage new ways of learning.

7.4 CONTEMPORARY ISSUES IN EDUCATIONAL TECHNOLOGY

Information and communication technology has been accepted as a powerful tool that transforms education. The emergence of new and innovative uses of technology provides new approaches to social studies teaching. Many governments have invested vast amounts of money to enhance schools with technology and provide them with Internet access to encourage teachers to use these new approaches. However, numerous barriers still need to be considered carefully when technology is used for teaching and learning purposes.

Randomized Field Experiments

Given the importance of balancing external validity (application) and internal validity (control) in educational technology research, an especially appropriate design is the randomized field experiment in which instructional programs are evaluated over relatively long periods of time under realistic conditions. In contrast to descriptive or quasi-experimental designs, the randomized field experiment requires random assignment of subjects to treatment groups, thus eliminating differential selection as a validity threat.

For example, Reiser, Driscoll, and Vergara randomly assigned undergraduate students in a mastery-oriented educational psychology course to one of three treatment groups differing in mastery criteria (ascending difficulty on unit quizzes, descending difficulty, and fixed criterion). At the end of 15 weeks, students completed a comprehensive final examination. Results indicated that those in the fixed criterion group proceeded through the course at the steadiest pace and performed better than the other students.

The obvious advantage of the randomized-field experiment is high external validity. Had Reiser assigned volunteer subjects to the same treatments for a 1-or 2-hour "experimental" lesson, the actual conditions of learning would have been substantially altered and likely to have yielded different results. On the other hand, the randomized-field experiment concomitantly sacrifices internal validity, since its length and complexity permit interactions to occur with confounding variables. Reiser results, for example, might have been influenced by subjects discussing the study and its different conditions with one another after class (e.g., diffusion of treatments). The experimental results from such studies, therefore, reflect "what really happens" from combined effects of treatment and environmental variables rather than the pure effects of an isolated instructional strategy.

Basic-Applied Design Replications

Basic research designs demand a high degree of control to provide valid tests of principles of instruction and learning. Once a principle has been thoroughly tested with consistent results, the natural progression is to evaluate its use in a real-world application. For educational technologists interested in how learners are affected by new technologies, the question of which route to take, basic versus applied, may pose a real dilemma. Typically, existing theory and prior research on related interventions will be sufficient to raise the possibility that further basic research may not be necessary. Making the leap to a real-life application, however, runs the risk of clouding the underlying causes of obtained treatment effects due to their confounding with extraneous variables.

To avoid the limitations of addressing one perspective only, a potentially advantageous approach is to look at both using a replication design. “Experiment 1,” the basic research part, would examine the variables of interest by establishing a relatively high degree of control and high internal validity. “Experiment,” the applied component, would then reexamine the same learning variables by establishing more realistic conditions and high external validity. Consistency of findings across experiments would provide strong convergent evidence supporting the obtained effects and underlying theoretical principles. Inconsistency of findings, however, would suggest influences of intervening variables that alter the effects of the variables of interest when converted from their “pure” form to realistic applications. Such contamination may often represent “media effects,” as might occur, for example, when feedback strategies used with print material are naturally made more adaptive (i.e., powerful and effectual) via interactive CBI. (For example, a learner who confuses discovery learning with inquiry learning in response to an inserted lesson question may be branched immediately to a remedial CBI frame that differentiates between the two approaches, whereas his or her counterpart in a parallel print lesson might experience the same type of feedback by having to reference the response selected on an answer page and manually locate the appropriate response-sensitive feedback in another section of the lesson.) The next implied step of a replication design would be further experimentation on the nature and locus of the altered effects in the applied situation. Several examples from the literature of the basic-applied replication orientation follow.

Assessing Multiple Outcomes in Educational Technology Experiments

The classic conception of an experiment might be to imagine two groups of white rats, one trained in a Skinner box under a continuous schedule of reinforcement and the other under an intermittent schedule. After a designated period of training, reinforcement (food) is discontinued, and the two groups of rats are compared on the number of trials to extinction. That is, how long will they continue to press the bar even though food is withheld?

In this type of experiment, it is probable that the single dependent measure of "trials" would be sufficient to answer the research question of interest. In educational technology research, however, research questions are not likely to be resolved in so straightforward a manner. Merely knowing that one instructional strategy produced better achievement than another provides little insight into how those effects occurred or about other possible effects of the strategies. Earlier educational technology experiments, influenced by behavioristic approaches to learning, were often subject to this limitation.

Released from the rigidity of behavioristic approaches, contemporary educational technology experimenters are likely to employ more and richer outcome measures than did their predecessors. Two factors have been influential in promoting this development. One has been the predominance of cognitive learning perspectives in the past 2 decades; the other has been the growing influence of qualitative research methods.

Cognitive Applications

We discuss influences of cognitive theory to contemporary educational measurement practices. One key contribution has been the expansion of conventional assessment instruments so as to describe more fully the "cognitive character" of the target. Among the newer, cognitively derived measurement applications that are receiving greater usage in research are tests of declarative and procedural knowledge, componential analysis, computer simulations, faceted tests, and coaching methods, to name only a few.

Whereas behavioral theory stressed learning products, such as accuracy and rate, cognitive approaches also emphasize learning processes. The underlying assumption is that learners may appear to reach similar destinations in terms of observable outcomes but take qualitatively different routes to arrive at those points. Importantly, the routes or "processes" used determine the durability and transferability of what is learned. Process measures may include such variables as the problem-solving approach employed, level of task interest, resources selected, learning strategies used, and responses made on task. At the same time, the cognitive approach expands the measurement of products to include varied, multiple learning outcomes such as declarative knowledge, procedural knowledge, long-term retention, and transfer.

This expanded approach to assessment is exemplified in a recent experiment by Hicken, Sullivan, and Klein . The focus of the study was comparing two types of learner control ("FullMinus" vs. "LeanPlus") under two conditions of incentives (performance contingent vs. task contingent). In the FullMinus condition, learners could selectively bypass elements of a full instructional program, whereas in the LeanPlus condition, they could opt to add elements to a core program. Degree of learning, assessed via a posttest on the unit studied, reflected advantages for FullMinus learner control and performance-contingent incentives. This information alone, however, would have provided little insight into why those strategies were effective. Accordingly, Hicken also examined learner-control option use (i.e., optional examples, practice examples, and review screens), which showed that FullMinus subjects used 80% of the options, whereas LeanPlus subjects used only 37%. Apparently, learners, given individual control over instruction, are inclined to choose the "default 'option, which in the case of FullMinus produces exposure to higher levels of instructional support and, in turn, better learning. Further analyses showed typical patterns of option use by learners in the four conditions, time spent on the overall program and on option usage, and student attitudes. Using these multiple outcome measures, the researchers acquired a comprehensive perspective on how processes induced by the different strategies culminated in the learning products obtained.

Use of special assessments that directly relate to the treatment is illustrated in a study by Shin, Schallert, and Savenye. Both quantitative and qualitative data were collected to determine the effectiveness of leaner control with elementary students who varied in prior knowledge. An advisement condition that provided the subject with specific directions as to what action to take next was also employed. Quantitative data collected consisted of both immediate and delayed posttest scores, preferences for the method, self-ratings of difficulty, and lesson completion time. The qualitative data include an analysis of the path each learner took through the materials. This analysis revealed that no advisement students became lost in the hypertext "maze" and often went back and forth between two sections of the lessons as though searching for a way to complete the lesson. In contrast, students who received advisement used the information to make the proper decisions regarding navigation more than 70% of the time. Based on the qualitative analysis, they concluded that advisement (e.g., orientation information, what to do next) was necessary when learners can freely access (e.g., learner control) different parts of the instruction at will. They also concluded that advisement was not necessary when the program controlled access to the instruction.

Another example of multiple and treatment-oriented assessments is found in Neuman's study on the applicability of databases for instruction. Neuman used observations of the students using the database, informal interviews, and document analysis (e.g., review of assignment, search plans, and search results). This triangulation of data provided information on the design and interface of the database. If the data collection were limited to only the number of citations found or used in the students' assignment, the results might have shown that the database was quite effective. Using a variety of sources allowed the researcher to make specific recommendations for improving the database rather than simply concluding that it was beneficial or not.

Qualitative Research

In recent years, educational researchers have shown increasing interest in qualitative research approaches. Such research involves naturalistic inquiries using techniques such as in-depth interviews, direct observation, and document analysis. Unfortunately, in recalling our personal experiences at recent AECT meetings, the reaction by some researchers has been to view quantitative and qualitative paradigms as competing or even mutually exclusive. Our position, in congruence with what is likely the majority opinion (albeit a silent one at times), is that quantitative and qualitative research are each more useful when used together than when used alone. Both provide unique perspectives, which, when combined, are likely to yield a richer and more valid understanding.

Presently, in educational technology research, experimentalists have been slow to incorporate qualitative measures as part of their overall research methodology. To illustrate how such an integration could be useful. The focus of their study was the effects of cooperative learning and need for affiliation on performance and satisfaction in learning from instructional television. Findings showed benefits for cooperative learning over individual learning, particularly when students were high in affiliation needs. While we and the reviewers evaluated the manuscript positively, a shared criticism was the lack of data reflecting the nature of the cooperative interactions. It was felt that such qualitative information would have increased understanding of why the treatment effects obtained occurred. Seemingly, the same recommendation could be made for nearly any applied experiment on educational technology uses.

Item Responses vs. Aggregate Scores as Dependent Variables

Consistent with the "expanded assessment" trend, educational technology experiments are likely to include dependent variables consisting of one or more achievement (learning) measures, attitude measures, or a combination of both types. In the typical case, the achievement or attitude measure will be a test comprised of multiple items. By summing item scores across items, a total or "aggregate" score is derived. To support the validity of this score, the experimenter may report the test's internal-consistency reliability (computed using Cronbach's alpha or the KR-20 formula) or some other reliability index. Internal consistency represents "equivalence reliability'!--the extent to which parts of a test are equivalent. Depending on the situation, these procedures could prove limiting or even misleading with regard to answering the experimental research questions.

A fundamental question to consider is whether the test is designed to measure a unitary construct (e.g., ability to reduce fractions or level of test anxiety) or multiple constructs (e.g., how much students liked the lesson and how much they liked using a computer). In the latter cases, internal consistency reliability might well be low, because students vary in how they perform or how they feel across the separate measures. Specifically, there may be no logical reason why good performances on, say, the "math facts" portion of the test should be highly correlated with those on the problem-solving portion (or why reactions to the lesson should strongly correlate with reactions to the computer). It may even be the case that the treatments being investigated are geared to affect one type of performance or attitude more than another. Accordingly, one caution is that, where multiple constructs are being assessed by *design,* internal-consistency reliability may be a poor indicator of construct validity. More appropriate indices would assess the degree to which:

(a) items within the separate subscales intercorrelate (subscale internal consistency),
(b) the makeup of the instruments conforms with measurement objectives (content validity),
(c) students answer particular questions in the same way on repeated administrations (test-retest reliability), and
(d) subscale scores correlate with measures of similar constructs or identified criteria (construct or predictive validity).

Separate from the test validation issue is the concern that aggregate scores may mask revealing patterns that occur across different subscales and items. We will explore this issue further by examining some negative and positive examples from actual studies.

Aggregating Achievement Results

Recently, we evaluated a manuscript for publication which described an experimental study on graphic aids. The main hypothesis was that such aids would primarily promote better understanding of the science concepts being taught. The dependent measure was an achievement test consisting of factual (fill-in die-blank), application (multiple-choice and short answer), and problem-solving questions. The analysis, however, examined total score only in comparing treatments. Because the authors had not recorded subtest scores and were unable to rerun the analysis to provide such breakdowns (and, thereby, directly address the main research question), the manuscript was rejected.

Aggregating Attitude Results

More commonly, educational technology experimenters commit comparable oversights in analyzing attitude data. When attitude questions concern different properties of the learning experience or instructional context, it may make little sense to compute a total score, unless there is an interest in an overall attitude score. For example, in a study using elaborative feedback as a treatment strategy, students may respond that they liked the learning material but did not use the feedback. The overall attitude score would mask the latter, important finding.

For a brief illustration, we recall a manuscript recently submitted to ETR&D in which the author reported only aggregate results on a post-lesson attitude survey. When the need for individual item information was requested, the author replied, “the KR-20 reliability of die scale was .84; therefore, all items are measuring the same thing.” While high internal consistency reliability implies that the items are "pulling in the same direction," it does not also mean necessarily that all yielded equally positive responses. For example, as a group, learners might have rated the lesson material very high, but the instructional delivery very low. Such specific information might have been useful in furthering understanding of why certain achievement results occurred.

Effective reporting of item results was done by Welsh, Murphy, Duffy, and Goodrum in investigating the effects of different link displays for accessing information in a hypermedia system.

The three displays were:

(a) an arrow indicating that some type of elaboration was available;

(b) six unique icons, each designating a different elaboration type; and

(c) a submenu structure. In addition to an assessment of the number and type of elaborations students accessed, one of the dependent measures was an attitude measure of "ease of reading." The analysis of total attitude scores showed, as the only trend, a predictable preference for the submenu (since the display was less cluttered). Individual item results further revealed that participants in general tended to agree with the statements, "The arrows that I clicked on in the text were distracting," and "A computer text screen without arrows would have been easier to read." The authors concluded on this basis that, regardless of the link strategy used, novice users of hypermedia are initially distracted by unfamiliar symbols embedded in the text. More insight into user experiences was thus obtained relative to examining the aggregate score only. It is important to keep in mind, however, that the multiple statistical tests resulting from individual item analyses can drastically inflate the chances of making a type I error (falsely concluding that treatment effects exists). Usage of appropriate statistical controls, such as MANOVA or a reduced alpha (significance) level, is required.

Media Studies vs. Media Comparisons

As confirmed by our analysis of trends in educational technology experimentation, a popular focus of the past was comparing different types of media-based instruction to one another or to teacher-based instruction to determine which approach was "best."

For present purposes, these considerations present a strong case against experimentation that simply compares media. Specifically, two types of experimental designs seem particularly unproductive in this regard. One of these represents treatments as amorphous or "generic" media applications, such as CBI, interactive video, Personalized System of Instruction, lecture, and the like. The focus of the experiment then becomes which medium "produces" the highest achievement. The obvious problem with such research is the confounding of results with numerous media attributes. For example, because CBI may offer immediate feedback, animation, and sound, while a print lesson may not, differences in outcomes from the two types of presentations would be expected to the extent the differentiating attributes impact criterion performance.

A second type of inappropriate media comparison experiment is to create artificially comparable alternative media presentations, such that both variations contain identical attributes but use different modes of delivery. We described a study in which CBI and a print manual were used to deliver the identical programmed instruction lesson. The results, which predictably showed no treatment differences, revealed little about CBI's capabilities as a medium compared to those of print lessons. Similarly, to learn about television's "effects" as a medium, it seems to make more sense to use a program like Sesame Street as an exemplar than a "talking head" from a taped, unedited lecture. (This does not mean, however, that comparing the talking head to a live head would be inappropriate in an evaluation study of a particular instructional program that uses taped lectures.)

So where does this leave us with regard to experimentation on media differences? We propose that researchers consider two related orientations for “media studies.” Both orientations involve conveying media applications realistically, whether “conventional” or “ideal” (cutting edge) in form. Both also directly compare educational outcomes from the alternative media presentations. However, as will be explained below, one orientation is deductive in nature and the other is inductive.

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Issues in Educational Science and Technology

Today, technology is possibly the most powerful factor shaping the educational landscape. Many school districts are demonstrating their support for increased thresholds of technology in schools by providing hardware like tablets and computers, improving internet connectivity, as well as implementing programs aimed at improving computer literacy both for teachers and students. Modern information and communication technology (ICT) has the potential to fundamentally transform education, but this potential has yet to be realized. As modern ICTs continue to progress rapidly and intensely change almost each aspect of society, it is fundamental that the field of education benefits from ICT advancement in order to prepare the next generation of digital citizens.

This book deals with conceptual and empirical information that examine critical issues around technology integration in education. It is clear the challenges that educational technologists face regarding technology integration in learning, instruction, and performance are significant and that the current state of educational technology research reminds one of the challenge of shooting at a moving target. The field of educational technology is a dynamic discipline. However, an agreement on some basic definitions, make it easier to frame a discussion of the future of educational technology. Technology [educational] integration is the incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools. Technology resources are computers and specialized software, network-based communication systems, and other equipment and infrastructure. Practices include collaborative work and communication, Internet-based research, remote access to instrumentation, network-based transmission and retrieval of data, and other methods. Some challenges confound small-scale ETI system upgrades or expansion work, while other challenges wreak havoc on large-scale and system-wide efforts. An understanding of these potential challenges can prepare educational technologists to meet them head-on across the modern multicultural community. The book focuses on K-12 contexts and defines educational technologists as the front-line professionals who are educated and trained to address the challenges of analyzing, designing, developing, implementing, evaluating and researching technology integration in educational settings. However motivated, educational technologists will encounter many challenges involving planning, people, resources and ethical issues that can jeopardize ETI solutions and outcomes.

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ISBN 978-1-98467-827-0

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