# CHAPTER – I
## INTRODUCTION

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CHAPTER I
INTRODUCTION

1.0 INTRODUCTION

The very purpose of educational technology is to facilitate and improve the quality of human learning. It is concerned with achieving the goals of maintaining internal discipline, adapting to its environment etc. For solving the varied problems of education successfully, there is a need to apply educational technology consisting of various media of mass communication, suitable child learning processes, and modern testing and evaluation techniques are essential. Especially in developing countries like India, it has to be mastered and utilized by educationists if they are to keep pace with each other and catch up with the developed nations. As such, both quantitative expansion and qualitative improvement of education can be facilitated and accelerated with the help of educational technology.

Today, technology of education is being developed with the aim not only of making education more widely available, but also for improving the quality of education which is already available. Educational technology is conceptualized audio-visual aids. It is also concerned with the management and organization of man and material.

Further, educational technology is concerned with providing appropriately designed learning situations, which hold in view the objectives of teaching. It modifies the learner's environment through the varied techniques of presentation, arrangement of learning activities and organization of social and physical surroundings. The purpose of educational technology is to improve the quality of human learning. The uniqueness of educational technology is characterized as:

(1) Use of a broad range of resources for learning

(2) Emphasis on individualized learning and

(3) Use of systems approach
The effectiveness of educational technology depends on:

(1) Ability to achieve goals

(2) To maintain itself internally and

(3) To adapt to its environment

Educational technology is concerned with the disciplined and systematic approach to education and training. It is a sort of investment in national development. Employment structures can be neatly geared to make the best need of development. The entire educational system is educational technology adapting itself to the changing environmental conditions. Thus, the scope of educational technology has become very vast.

1.1 NATURE OF EDUCATIONAL TECHNOLOGY

So far, no one has universally agreed upon the definition of the term "educational technology". For most people the term brings to mind such electronic gadgetry as film projectors, tape recorders, television sets and micro-computers which are used as teaching tools. Other people add such nonelectrical instructional materials as books, photographs and charts. Still others subscribe to a definition that includes not only items used in teaching but also equipments used in educational administration keeping students' records on the micro film, communicating between schools by radio, correcting entrance examination papers with the aid of a computer and the like. In fact, educational technology can mean different things to different people even those who have specialized in this field have failed to arrive at a proper definition. However, in an attempt to satisfy everyone, the Association for Educational Communications and Technology in the United States have come to the following definition: "Educational technology is 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 learning."

Extensive use of educational technology requires a left of change on the part of the teacher. This is because some technologies are not accepted or only partly accepted because they require too many adjustments of traditional methods of
instruction or administration. Frequently, teachers avoid attempting a new instructional technique because it requires too much for them in energy, time, patience or skill to become adopt in its use. Altering old teaching habits in order to master new ones entails not only the expenditure of energy but also the risk of a teacher looking foolish by committing embarrassing errors when attempting new techniques in the classroom. In addition, teachers who have traditionally perceived themselves as classroom's chief performers lecturing, conducting recitations, leading class discussion can feel demoted to a less prestigious educational role when they are asked to have reading materials, radio, television or computers to deliver the content of lessons.

Thus, the amount of change required in the existing habits and the fear of failure or of decreased prestige can affect the teachers' willingness to accept a new technology. Electronic equipment may frighten teachers with its apparent complexity. At least a part of this fear comes from the expectation that something may go wrong during the lesson, making the teacher appear inept or unable to control the teaching situation. To utilize educational television (ETV), many teachers think that much training and general reevaluation of teaching goals and activities would be required. However, such fears are baseless. The evolution of technology has in fact ushered in a kind of revolution in our occupational, social and educational world. But it seems a little awkward to observe that whereas the contribution of some kind of technology is visibly felt in respect of the operation of our hospitals, factories, farms and offices, our classrooms have remained a unique example of backwardness by remaining insensitive to the technological inputs and their influences. The reasons are not far to seek. Our teacher and via him/her the processes of educational resource generation have not properly assimilated or understood the importance and relevance of technology for the classroom. Also the overall ecology of the formal educational system is responsible to a considerable extent for this state of affairs.

Earlier educators used to advocate the use of audio-visual aids in the process of teaching in addition to supplementary aids such as pictures, charts, maps, models and various audio-aids. Gradually, the emphasis shifted to the employment of costly gadgets such as video and computers and now the multi-media and e-Learning
approach. In brief, it may then be said that the entire principle of educational technology lies in the:

(1) Use of a broad range of resources

(2) Emphasis on individualized learning and

(3) Emphasis on systems approach to education.

1.2.0 EMERGING TRENDS IN EDUCATIONAL TECHNOLOGY

Educational technology can be regarded, as the application of systematic knowledge about learning and instruction to teaching and training with the aim of improving their quality and efficiency. For this reason, a wide range of presentation, control and feedback devices may be employed such as teaching machines, stimulators and computers. It should, however, be emphasized that techniques such as critical path analysis, curriculum development methods and task analysis are essential components as well as the hardware system. In fact, as long as programmed learning co-ordinates these techniques, it is woven into the fabric of educational technology. The point is that it is not merely a system of presentation, a particular technique or a set of principles; it is a methodology for discovering an efficient means of organizing learning situations to attain specified objectives.

The two major trends that have developed in the process of educational technology are: (1) technology for mass instruction and (ii) technology for individual instruction. Included in the first type are instructional broadcasting, television filmed lectures, CCTV, motion pictures etc. Under technology for individual instruction, there are equipments and materials designed for individual operation such as teaching machines, programmed instruction, auto-tutorial system, computer-assisted instruction, language laboratories, learning modules etc.

1.2.1 Programmed Instruction

In a fast developing world, the teacher cannot and ought not to be left alone to depend upon his own resources and talents to disseminate knowledge to the pupils. The classroom teacher should be supplied with reliable instructional material based upon the dependable findings of educational technology. This will help him to
do his job with maximum perfection. Programmed learning is one such big step in this direction. In this, the subject-matter or content of the course displays a few distinct characteristics such as:

- a clear-cut statement of the objectives
- the material to be learned is itemized and presented serially
- Frequent and unambiguous responses from every student are required throughout the whole sequence. Unless the learner makes some responses which are relevant to the learning task, no learning will occur
- Feedback of information about the correctness or otherwise of the responses is given to the pupil before the next frame or item is presented

### 1.2.2 Modular Scheduling

A module is a short unit of instruction dealing with a single conceptual unit of subject matter. Each course is built in the "bank" of a number of modules and each module is designed around a list of objectives and student projects. A variety of learning activities centered on the learner and incorporating a multi-media approach is provided. The components of modules include modular lecture unit, laboratory unit, programmed instruction unit, workshop unit, individual study unit, film unit, audio-tape unit, video-tape unit etc.

### 1.2.3 Multimedia Approach

For effective and efficient learning, it is now accepted that there should be a multi-media approach. Dale, Edgar (1969) through his "Cone of Experience" has demonstrated that in any learning situation, the more the senses are stimulated, the more the person learns and the longer he retains. Dale describes how the different types of aids, starting from verbal symbols up to direct purposeful experiences, are interrelated and effective in the learning process. The different materials of the experiences presented in the cone may be classified into three: (i) non-projected aids (ii) projected aids and (iii) activity aids.
The following are some specific applications of instructional technology in imparting formal education:

x Use films, television, slide-tape presentation and so forth as an alternative to a lecture for presentation of information.

x Buy, borrow or produce 2” x 2” colour slides, showing the steps in a process to be demonstrated.

x Use an opaque projection to show a printed diagram.

x Make a transparency from a cartoon or drawing in a few seconds on a thermo graphic copier and show it to the class using an Over Head Projector (OHP).

x Draw chalkboard diagrams once on transparency masters; then project the transparencies made from these masters on OHP, thus saving the time wasted in rewording them each year.

x Recorded questions, problems, exercises and background information on different subject or at different levels of difficulty on tape for use by individuals or small groups with cassette play back units. While some students are interacting with the recorded material, the teachers will be free to work intensively with the others.

1.3 INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATION

Today’s world is a world of information explosion. This information explosion is taking place in such a fast speed that even a literate person is feeling as if he or she is illiterate being not able to cope up with such an information explosion. Here the question arises how is one to cope up with it? The answer is information technology (IT) that can help in coping with the information explosion. So, it can be said that Information Technology is nothing but coping up with explosion of Information. Information technology (IT) is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics based combination of computing and telecommunication. The term in its modern sense first appeared in a 1958 article published in the Harvard Business Review, in which authors Leavitt and Whisler commented that the new technology
does not yet have a single established name and is called as information technology. It spans a wide variety of areas that include but are not limited to things such as processes, computer software, computer hardware, Programming Languages and data constructs. In short, anything that renders data, information or perceived knowledge in any visual format whatsoever, via any multimedia distribution mechanism, is considered part of the domains space known as Information Technology.

Globalization and technological changes have created a new global economy powered by technology, fueled by information and driven by knowledge. The emergence of this new global economy has serious implications for the nature and purpose of educational institutions. As the access to information continues to grow rapidly, schools cannot be contented with the limited knowledge to be transmitted in a fixed period of time. They have to become compatible to the ever expanding knowledge and also be equipped with the technology to deal with this knowledge.

Information and communication technologies (ICTs) which include radio and television, as well as newer digital technologies such as computers and the Internet have been proven as potentially powerful tools for educational change and reform. When used appropriately, different ICTs can help to expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by helping to make teaching and learning into an active process connected to real life. ICT is being utilized in every part of life. Due to the increasing importance of the computer, students-the future citizens cannot afford to keep themselves aloof from this potential medium. In education, use of ICT has become imperative to improve the efficiency and effectiveness at all levels and in both formal and non-formal settings. Education even at school stage has to provide computer instruction. Profound technical knowledge and positive attitude towards this technology are the essential prerequisites for the successful citizens of the coming decades.

ICT in education is any technology that deals with the exchange of information or in other words communication in the teaching learning process. Uses of Electronic learning technology like, teleconferencing, power point presentations,
CD ROM are communication technology which is the part of ICT. It encompasses hardware approach like use of machines and materials, software approach like use of methodologies and strategies of teaching learning and system approach that uses the management technology that deals with the systematic organization of the hardware and the software. Now a days, different software are used in different department of education; e.g. library software, administration software, software related to managing the entire teaching learning process. ICT in education is the support material in the hands of the human resource involved in the educational process in order to enhance the quality of education. ICT in education comprises of the application of Online, Off-line learning with the help of the computer technology.

1.4 ICT FOR EFFECTIVE LEARNING ENVIRONMENTS

Education should offer conditions needed to optimize learning and promote the transfer of knowledge and skills. Authenticity is an important issue which should be addressed in the design and development of learning environments (Collins, 1996). Learning environments need to reflect the potential uses of knowledge that pupils are expected to master, in order to prevent the acquired knowledge from becoming inert (Bransford, Sherwood, Hasselbring, Kinzer & Williams, 1990; Duffy & Knuth, 1990). Rich contexts and tasks that are as authentic as possible should be provided by presenting links to the world outside school. In addition, teachers should stimulate pupils to engage in active knowledge construction. This calls for open-ended learning environments instead of learning environments which focus on a mere transmission of facts (Collins, 1996; Hannafin, Hall, Land, & Hill, 1994; Jonassen, Peck, & Wilson, 1999). Co-operation and interaction in the classroom environment are important in order to foster the acquisition of learning skills, problem solving skills, and social relations (Bennett & Dunne, 1994; Slavin, 1995; Susman, 1998). Finally, since classes are of mixed ability, differentiation is considered to be one of the key criteria for effective classroom practice (Bearne, 1996; Kerry & Kerry, 1997; Wang, 1990).

Teachers are expected to adapt the educational setting to the needs and capabilities of the individual pupils. Powerful learning environments foster optimal learning processes by reflecting the key aspects outlined above. In conclusion, the
following four main characteristics of powerful learning environments are
distinguished:

- Rich contexts and tasks that are as authentic as possible are provided to
  present links to the world outside school
- Active and independent learning is stimulated
- Co-operative learning is stimulated
- The curriculum is adapted to the needs and capabilities of the individual
  pupils

ICT may contribute to create powerful learning environments in numerous
ways. ICT provides opportunities to access an abundance of information using
multiple information resources and viewing information from multiple perspectives,
thus fostering the authenticity of learning environments. ICT may also make
complex processes easier to understand through simulations and it contribute to
authentic learning environments. Thus, ICT may function as a facilitator of active
learning and higher-order thinking (Alexander, 1999; Jonassen, 1999). The use of
ICT may foster co-operative learning and reflection about the content (Susman,
1998). Furthermore, ICT may serve as a tool to curriculum differentiation, providing
opportunities for adapting the learning content and tasks to the needs and
capabilities of each individual pupil and by providing tailored feedback (Mooij,
1999; Smeets & Mooij, 2001). As Stoddart and Niederhauser (1993) point out, ICT
may fit into a spectrum of instructional approaches, varying from traditional to
innovative. Niederhauser and Stoddart (2001) distinguish two main types of
software use in education: skill-based transmission software, and open-ended
constructivist software. Typically, skill-based software aims at enhancing pupils’
skills by administering drill and practice exercises. Open-ended software may serve
as a tool for helping learners build knowledge (Jonassen, 1999; Squires, 1999). This
type of ICT use may be expected to contribute to powerful learning environments.

In addition, teachers’ pedagogical perspectives and their views on how ICT
can contribute to the learning environment may play an important role in their actual
use of ICT in the classroom (Drenoyanni & Selwood, 1998; Higgins & Moseley,
2001; Hokanson & Hooper, 2000; Niederhauser & Stoddart, 2001). However, Sinko and Lehtinen (1999) point out that often there is a conflict between approving of certain principles with regard to learning environment design and development by teachers, and the actual implementation of these principles in classrooms. The shift towards more pupil-centred learning environments requires teachers to create an intellectual environment in which knowledge is acquired. The teacher is no longer the all-knowing controller of activities. At times, she or he is learner and explorer with the pupils. In particular, this applies to open-ended learning arrangements (Hannafin & Savenny, 1993; Keeler, 1996). Niederhauser and Stoddart (2001) found that teachers who adhered to traditional transmission approaches to instruction, tended to prefer skill-based software, whereas most teachers who supported constructivist views of teaching and learning, used skill-based as well as open-ended software. This conclusion is consistent with observations made by Pisapia (1994) that in exemplary classrooms teachers may use resources in different ways, such as drill and practice exercises, simulations, problem-solving activities, and productivity tools. A characteristic of these classrooms is that the use of learning technologies by the pupil is woven integrally into the patterns of teaching. Teacher-centered teaching, on the other hand, tends to use traditional instructional methods. Further, Demetriadis et al. (2003) concluded that teachers are strongly oriented towards fulfilling the established school instructional targets. As a result of this, according to these authors, teachers tend to ignore innovative learning activities because they are disturbing.

1.5 INSTRUCTIONAL DESIGN

Instructional design is a systematic approach to planning and producing effective instructional materials. It is similar to lesson planning, but more elaborate and more detailed. It is the entire process for analysis of learning needs, goals and the development of a delivery system to meet those needs. It includes development of instructional materials and activities; and tryout and evaluation of all instruction and learner activities. Instructional Design is the art and science of creating an instructional environment and materials that will bring the learner from the state of not being able to accomplish certain tasks to the state of being able to accomplish those tasks. Instructional Design is based on theoretical and practical research in the
areas of cognition, educational psychology, and problem solving. Learning theories can help instructors and designers select the design model most congruent with their educational philosophies.

1.6 NEED FOR INSTRUCTIONAL DESIGN

Instructional designs provide a concrete plan and an evidence of what is and why is it being transacted in the teaching learning situation. Content, discussions, interactions, etc. can all be evaluated and reviewed by persons other than the instructor. As such, quality can be assessed more objectively. Instructional Design is a quality process. It seeks to ensure that critical concepts are explored through content presentation and learning activities. The greatest objective of Instructional Design is to serve the learning needs and success of the students through effective presentation of content and fostering of interaction. The followings are other benefits of Instructional Design:

- Instructional Design focuses on the most effective way to present content
- Instructional Design begins with the learner and the learner’s experience
- Quality of course is ensured through Instructional Design - covers all the phases of good development
- Instructional Design gives structure to the student's process of working through course material
- Compared with a human instructor, technology is less adaptive. Once a plan of integration is implemented, it is less likely to change it according to student's reactions. This is why instructional design plays an important role in bridging pedagogy and technology
- Strategies for teaching via a chosen medium have to be well-thought-out. Instructional design can help educators making the best use of technology; therefore a successful integration can be guaranteed.
- Pedagogy must drive the choice of instructional technology, not the other way around (Chizmar & Walbert, 1999)
1.7 LEARNING THEORIES AND THEIR IMPLICATIONS FOR INSTRUCTIONAL DESIGN

Learning theories have significant bearing on instructional design, as there is a logical development from learning to instruction. Instructional design optimizes learning outcomes while learning theories are the backbone of any instructional design. Instructional design is the articulation or the manifestation of the learning theories, and its main aim is to optimize learning by using the known theories of learning.

Strain (1994) states that a wide divergence of views exists among the researchers in instructional design regarding the relative contribution of various schools of psychology and claims that instructional design has grown out of the systems approach with its roots firmly in behaviourist psychology that has dominated instructional design since the 1960s. However, Hannafin and Reiber (1989) point out that instructional design developed in the 1980s by Gagne, Merrill, Reigeluth and Scandura is largely due to the influence of cognitive theories of learning. However, more recent developments are due to constructivist learning theories. Instructional designers no longer depend on any one theory. They draw upon and incorporate from different learning theories, mix those with other information and apply the results to meet human needs.

Let us examine the three basic schools of theories of learning, namely, behaviourism, cognitivism and constructivism. These three schools of learning theories have implications for instructional design. In short, behaviorists believe that learning results in changing the learning behaviour whereas cognitivists believe that learning occurs when learners add new concepts and ideas to their cognitive structure. Constructivists believe that the learners construct knowledge for themselves - each learner individually. All the three learning theories have implications for instructional design.

Behaviourists emphasize changes in behaviour as the outcome of learning. Behaviourist principle of reinforcement, retention and transfer of learning are important design considerations, as learning is facilitated by reinforcing the correct performances. Statements of behavioural objectives allow the learners to know
specifically when they have achieved their objectives. In this way, learners can monitor their own progress. The knowledge of objectives serves as a reinforcing agent. The frequency of reinforcement is also a design issue. Presenting the content of the instruction in smaller steps, followed by testing and reinforcing performance immediately, does this. Retention of the information for the learners is also important for the instructional designer. Materials that provide more reinforcing activities help in the retention of what has been learnt.

Cognitive psychologists like Piaget, Bruner and Ausubel contend that learning is an internal process that cannot be observed directly. Learners first remember and then retrieve information from the memory. Cognitivists emphasize on how the human mind works. They put particular emphasis on memory. The implication of this theory for the instructional designers is that they could use various techniques like chunking, mnemonics and meaningful organization of content and give practice for storing and retrieving information. Practice implies provision of increased opportunities to the learners for reward and reinforcement. Cognitive structures are created through practice, which leads to an efficient use of long-term memory. For example, instructional designers include pictures used in video programmes or practice exercises in the self-learning material that offer opportunities for practice. Practice is important in learning cognitive tasks as well as motor skills.

Constructivists promote an open ended learning experience where methods and results of learning are not easily measured and are different for each learner. The implication of constructivism for the instructional designer is that the learners should attach themselves to the content domains. Constructivists believe that learning occurs when it is situated, contextual, problem based, social and authentic. Learning theories influence Instructional Design in a significant way. Learning theory becomes an essential element in the preparation of instructional design professionals because they permeate all dimensions of instructional design (Schiffman, 1991). There is no one single theory which designers keep in mind while designing the instructional strategies and content. Ertmer and Newby (1993) feel that the
x Behavioural approach can effectively facilitate mastery of the content,

x Cognitive strategies are useful in teaching problem solving tactics, and

x Constructivist strategies are suited for dealing with ill defined problems.

1.8 INSTRUCTIONAL DESIGN THEORIES

A theory provides a general explanation for observations and explains the behaviour whereas a model is a mental picture that helps us to understand something that cannot be viewed or experienced directly (Dorin, et. al. 1990). There are various instructional design theories and models developed by various authors. Reigeluth (1999) defines an instructional design theory as the one that offers explicit guidance on how to help people to learn better and develop. The kinds of learning may include cognitive, emotional, social, physical and spiritual learning. So, Reigeluth (1999) states four major characteristics that all instruction design theories have in common. These are:

x Design Orientation

x Identification of methods of instruction and situations

x Methods of instruction can be broken down into more detail components and methods

x Choice of probabilistic methods

The Instructional Design theories have become important as they help the stakeholders to develop a vision of the instruction early in the design process (Diamond, 1980). This vision is in terms of ends (how learners will be different as a result of it) and the means (how those changes in the learners will be fostered). Banathy (1991) states that instructional design theories should allow for much greater use of the notion of user designer. This means that the users play a major role in designing their own instruction.

The Instructional Design theories are also important as they provide guidance at three levels (Reigeluth, 1999). These are:
methods that best facilitate learning under different situations

x learning tool features that best allow an array of alternative methods to be
made available to learners

x System features that best allow an instructional design team to design quality
learning tools

1.9 INSTRUCTIONAL DESIGN MODELS

Instructional design is defined as a system or process of organizing learning
resources to ensure learners achieve established learning outcomes. As such, it is
essentially a framework for learning. This framework asks the Instructional Designer
to assess the desired outcomes of the learning and begin to apply an Instructional
Design (ID) model that is most appropriate to assist in achievement of these desired
outcomes. Despite some Instructional Design models being quite generic in nature,
they are incredibly popular and capable because they present a very effective, yet
general, model to build various types of instruction to meet different objectives in
learning.

From a designer's perspective, various models can be followed in the
instructional design process. It is important to note that, at best, a model is a
representation of actual occurrences and, as such, should be utilized only to the
extent that it is manageable for the particular situation or task. Put another way,
perhaps one model is more effective for designing a mathematics course, and
another model is more effective for designing soft skill courses (like managing
people, customer service, etc.).

Instructional design models grew out of the teaching profession and came to
fruition during World War II when the nation had to be quickly trained and troops
mobilized to run the equipment of war. A combination of face-to-face, hands-on,
individualized, and group units of instruction were developed by the armed forces
using ID models to effectively train massive numbers of troops. However, all of
them share some basic features:

x Needs assessment

x Goal and objective identification
x Audience and setting analysis
x Content and delivery development
x Evaluation and redesign

Here is an overview of some different models for instructional design:

x ADDIE - refers to Analyze, Design, Develop, Implement, and Evaluate. This is possibly the best known design model, and is frequently used in academic circles.

x Dick and Carey Model - The Dick and Carey model prescribes a methodology for designing instruction based on a reductionist model of breaking instruction down into smaller components. Instruction is specifically targeted on the skills and knowledge to be taught and supplies the appropriate conditions for the learning of these outcomes.

x Robert Gagne’s ID Model – Gagne’s approach to instructional design is considered a seminal model that has influenced many other design approaches and particularly the Dick & Carey systems approach. Gagne proposed that events of learning and categories of learning outcomes together provide a framework for an account of learning conditions.

1.10 ADDIE MODEL

The ADDIE instructional design model is the generic process traditionally used by instructional designers and training developers. The five phases—Analysis, Design, Development, Implementation, and Evaluation—represent a dynamic, flexible guideline for building effective training and performance support tools.

**Analysis:** In the analysis phase, the instructional problem is clarified, the instructional goals and objectives are established and the learning environment and learner's existing knowledge and skills are identified.

**Design:** The design phase deals with learning objectives, assessment instruments, exercises, content, subject matter analysis, lesson planning and media selection. The design phase should be systematic and specific.
Development: The development phase is where instructional designers and developers create and assemble the content assets that were blueprinted in the design phase. In this phase, storyboards are created, content is written and graphics are designed. If e-Learning is involved, programmers work to develop and/or integrate technologies.

Implementation: During the implementation phase, a procedure for training the facilitators and the learners is developed. The facilitators' training should cover the course curriculum, learning outcomes, method of delivery, and testing procedures.

Evaluation: The evaluation phase consists of two parts: formative and summative. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for domain specific criterion-related referenced items and providing opportunities for feedback from the users which are to be identified.

It is an Instructional Systems Design (ISD) model. Most of the current instructional design models are spin-offs or variations of the ADDIE instructional design model. One commonly accepted improvement to this model is the use of rapid prototyping. This is the idea of receiving continual or formative feedback while instructional materials are being created. This model attempts to save time and money by catching problems while they are still easy to fix.

1.11 STAGES OF DEVELOPING INSTRUCTIONAL DESIGN

Stage 1 - Instructional Goals

Conduct analysis of a discrepancy between the ultimate, desired outcome and the present state of affairs. A perception of needs may or may not be an accurate assessment.

Stage 2 – Task Analysis

Task Analysis determines and lists the steps and skills used at each step in the given procedure involved in reaching the goal. The task analysis can include an Information-Processing Analysis (learners’ mental operations) and/or a Learning-Task Analysis (objectives of instruction involving intellectual skills).
Stage 3 – Audience and Environmental Analysis

The Audience Analysis determines which of the required enabling skills the learners bring to the learning task, such as intellectual skills, abilities (verbal comprehension, spatial orientation), and personality traits. The Environmental Analysis is used to evaluate the learning environment and its related conditions, advantages, and potential problems.

Stage 4 - Performance Objectives

Translate the needs and goals into specific and detailed objectives by determining whether the instruction is related to its goals. Considerations include focusing the lesson plan on appropriate learning conditions, guiding the development of performance measures, and assisting learners in their study efforts were applicable.

Stage 5 - Criterion-Referenced Test Items

Diagnose the necessary prerequisites for learning new skills through testing the results of student learning. Such diagnosis includes determination of performance measures before development of lesson plan and instructional materials, documentation of learners’ progress, and evaluation of the instructional system.

Stage 6 - Instructional Strategy

Outline how instructional activities relate to the objectives, ideally by demonstrating knowledge of the learners, their learning preference, and effectiveness of related teaching strategies. Tasks must be reflected in the objectives and the ideal delivery method and/or system is determined (teacher-led or learner-centered, group pace or learner pace, etc.).

Stage 7 - Instructional Materials

Ideally working closely with the Subject-Matter Expert (SME), determine available instructional materials and create a plan for developing unavailable, but required, materials to ultimately convey the events of instruction. Also determine the role of the instructor, if applicable.
Stage 8 - Development

While the larger burden of this stage falls on the developers of the courseware, the Instructional Design principles must fold into the process. The development is reviewed at particular milestones to ensure comprehensive Instructional Design strategies are present in the training, ensuring important concepts from clear navigation to valid information are present.

Stage 9 - Formative Evaluation

Provide data for revising and improving instructional materials after the overall instructional design document is completed. Ideally, evaluation should take place in both a small, representative sample environment (small group) as well as a field trial.

Stage 10 - Summative Evaluation

Study the effectiveness of system as a whole after the formative evaluation and actual implementation. A variety of methods can be used, from simple surveys to actual, related numbers (productivity, etc.). This stage generally occurs 6 to 12 months after the training has been implemented.

1.12 e-LEARNING – AN OVERVIEW

e-Learning is another way of teaching and learning. There is no clear and explicit definition of the concept of e-Learning. Definitions in the research literature are partially exclusive and sometimes contradictory, and there are few common terms used consistently (Anohina, 2005; Cohen & Nycz, 2006; Nichols, 2003). It is difficult to distinguish the term “e-Learning” from terms such as “virtual learning”, “network learning”, “online learning”, “multimedia-based learning”, “Web based learning”, “Internet-enabled learning”, and similar terms. From other e-Learning literatures, there is a general consensus that e-Learning in some way involves the use of ICTs to enhance and/or support learning activities (Kanuka, 2006). According to Horton (2001) e-Learning is defined as the use of Internet and digital technologies to create experiences that educate fellow human beings.
An attempt to define e-Learning, from a technological point of view, is to look at the relationships between e-Learning and some closely related concepts: Internet-based learning, Web-based learning, online learning, and computer-based learning (Hadjerrouit, 2007). The concept of Internet-based learning is broader than Web-based learning. Hence, the Web is only one of the Internet services that use Hypertext Markup Language (HTML), browsers, and URL. Internet offers many other services, not only Web, but also e-mail, file transfer facilities, etc. Learning could be based on the web, but also as correspondence via e-mail. Online learning could be organized through any network. Thus, Internet-based learning is only a subset of online learning.

e-Learning may also be defined as the acquisition and use of knowledge distributed and facilitated primarily by electronic means. This form of learning depends on networks and computers but may involve CD-ROMs, software, other media, and telecommunications. e-Learning can take the form of courses as well as modules and smaller learning objects. e-Learning may incorporate synchronous or asynchronous access and may be distributed geographically with varied limits of time (Wentling et al. 2000).

1.13 PEDAGOGICAL PRINCIPLES FOR E-LEARNING ENVIRONMENT

The e-Learning pedagogy focuses on the exploitation of information technologies to adapt to the varying learning scenarios and diverse student needs. Successful learning pedagogy requires teachers to understand how students learn and must have the capacity and autonomy to design, implement and assess educational activities that meet the needs of individual and all students (Chao et al., 2006).

System based on pedagogy does exist, but they give attention to only one or a few delivery methods. And as far as the pedagogy is concerned, there is no method that is superior to all others or that serves all learning needs equally well. This is valid for e-Learning as well. Instructional methods can be grouped into the following categories; presentation, demonstration, discussion, drill-and-practice, tutorial, cooperative learning, gaming, simulation, discovery, and problem solving (Heinich et al., 2002).
An important outcome of e-Learning is e-Content. e-Learning is a process and e-Content is a product. This approach of teaching has become all answer to the complicated modern, social, economic condition and an exploding population. e-Content lesson is generally designed to guide students through information or to help them perform specific tasks. An e-content package can be used as a teacher in the virtual classroom situation. Using e-Content, the time and finance involved in the teaching process can be minimized. e-Content facilitates individualized instruction.

1.14 MULTIMEDIA LEARNING RESOURCES FOR e-LEARNING

The rapid development of computer and Internet technologies has made e-Learning become an important learning method. One of the key characteristics of e-Learning is its capability to integrate different media, such as text, picture, audio, animation and video to create a multimedia instructional material, promoting the reading interests and willingness of the learner (Gillani & Relan, 1997; Vichuda et al., 2001).

Researches proved that humans have several forms of intelligence instead of a single static Intelligence Quotient (IQ) and individual learning styles are largely dependent on this diversity. A learner’s dominant sensory system, i.e. visual, auditory or kinesthetic, also plays a major role in determining their natural learning style. If the teaching style employed closely matches learner’s preferred style, learning becomes more natural and easier hence consequently reduces learning time and improve results (Collin, 1987). Multimedia technologies can be used to forge stimulating, interactive learning environments and are essential in the creation of e-Learning systems which support multiple learning styles as they present a wide range of graphical, textual and aural sources. Studies focused on the effectiveness of this type of education have proven that multimedia learning resources can enhance motivation, attention, comprehension and recall.

The inclusion of multimedia in the design of learning objects concerns the means used to make the content as illustrative as possible. The use of multimedia elements such as images and different animated formats are important here. Images are very useful when it comes to explaining difficult issues. Some difficulty
concepts in the laboratory experiments for instance, can be understood much more easily when explained using an appropriate multimedia object.

1.15 CONCLUSION

Considering the above said aspects, instructional designing as one of the important area in teaching and learning. Further, the e-Learning environment plays a vital role in effective instructional process in the recent years. Therefore, the investigator has selected this present study on Effectiveness of e-Content in Learning Mathematics (Integral Calculus) at Higher Secondary Level.