CHAPTER I

INTRODUCTION AND CONCEPTUAL FRAME WORK

1.1 INTRODUCTION

The research problem titled “Effectiveness of E-content in the Teaching of Mathematics Education among B.Ed. Student-Teachers” was chosen on the strength that our present education system is bound to cope up with the challenges of the modern world especially in the field of Teaching of Mathematics among the B.Ed. student-Teachers for the simple reason, that the would be teachers would be the king makers of our nation. It is evident therefore; heavy responsibility is on their shoulders to carry out this uphill task through their competent and effective teaching methods.

Teaching being a noble profession is an art by itself. Presentation of the materials is the style of any art. Hence, producing quality in teaching is the essence of the art of Teaching. Today's classroom teachers must be well prepared to provide technology-supported learning opportunities for their aspiring students. It goes without saying that being prepared to use technology and knowing how that technology can support student-learning, must become an integral part of every teacher's professional repertoire.

As a matter of fact the pace of change brought about by the rapid growth of science and new technologies has had a significant effect on the way people live, work and play worldwide. Hence, new and emerging technologies tend to challenge the traditional process of teaching and learning and the way education is managed. Emergence of Information technology, while an important area of study in its own right, is having a major impact across all curriculum areas. Easy worldwide communication provides instant access to a vast array of data, challenging the assimilation and assessment skills. Rapid communication, plus increased access to it in the home, at work, and in the educational establishments, could mean that learning becomes a truly lifelong
process, a process in which the pace of technology change forces constant evaluation of the teaching learning process itself.

In India there is a compelling social need for a switch over of education from the conventional method to the modern teaching methods. The reason being that it enhances the teaching and learning process to a desirable level which is in fact not seriously implemented. These modern teaching techniques lead to the Emerging Educational Technology, which is one of the crucial developments in the field of education. The use of Educational Technology is the newly evolved emerging branch of education and it plays a vital role in promoting and strengthening the teaching-learning process.

As such, it is a social necessity that the teachers must be prepared to empower students with the advantages technology can bring. Schools and classrooms, both real and virtual, must have teachers who are well equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills. Real-world connections, primary source material, and sophisticated data-gathering and analysis tools are only a few of the resources that can enable teachers to provide heretofore-unimaginable opportunities for conceptual understanding.

It has become quite obvious that the traditional educational practices no longer provide the prospective teachers with all the necessary skills for teaching the students, who must be able to survive economically in today's workplace. Teachers must teach the students to apply strategies for solving problems and to use appropriate tools for learning, collaborating, and communicating.

As a matter of fact, the problem is not necessarily lack of funds, but lack of adequate training and lack of understanding of how computers can be used to enrich the learning experience.
The advancement of the electronic media forces the teachers to change their traditional methods of teaching. Therefore the role of the teacher is also changing. Students need E-guru to explain the wealth of information available on-line. In short, with technological advancements the role of the teacher is more than that of facilitator, guide and resource seeker.

It becomes that imperative that the teacher has to make a lot of modifications and adjustment if he has to adopt multimedia approach. His role would have a different connotation compared to the traditional role. The teacher has to adopt a number of methods and techniques, for he cannot be satisfied with the more lecture or the chalk-talk method. The teacher has to be aware of the different available media and their availability.

New information and communications technologies (ICT) are changing the world we live in, and the way we learn to live. ICT changes teaching and learning through its potential as a source of knowledge, a medium to transmit the content, a means of interaction and dialogue. Thus, ICT is both a cause of change and a means of achieving it.

The role of the teachers has changed and continues to change from being an instructor to becoming a constructor, facilitator, coach, and creator of learning environments.

A new role of the teacher for the 21st century means that teachers should be primarily oriented towards guiding the students through the learning process. In this process information and communication technology (ICT) plays a significant role. So it is not surprising that more and more e-resources are available and can be used in the learning process. But the analysis of the existing resources often reveals that the authors of the resources do not use the opportunities offered by the new technologies. New technologies offer and at the very least give the teachers the chance to adapt the materials to their own and their learners' needs. The teachers are the ones who should personalize the content towards the specific student and the didactical situation in question.
Therefore, selection, adaptation and combination of resources are among the major parts of teacher's tasks. Resources should be prepared so that they can be easily adapted according to a particular didactical situation. So there is a conflict between the possibilities technology provides, the teachers’ wishes and the e-materials available.

1.2 EDUCATION

Education is a liberation force and in our age it is also a democratizing force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances – Indira Gandhi.

Education, in fact, is one of the major ‘life processes’ of the human individual, “just as there are certain indispensable vital processes of life in a biological sense. So education may be considered a vital process in a social sense. Education is indispensable to normal living. Without education, the individual would be unqualified for life’. Without education, human race would be no better than animal race. Eating, drinking, sleeping and sex – life are common to both animals and men. It is only knowledge and education, where they differ. “This world would have been enveloped in intellectual darkness, if it had not been illuminated by the light of education.” Education culturises the individual and helps him in his needs all over the world. It develops the individual like a flour which distributes its fragrance all over the environment. Lockey has aptly remarked, “Plants are developed by cultivation and men by education”. We can well summarise that the story of our civilization is the story of education.

Schools are expected to provide the opportunity to the students not just to complete the school successfully, but empower them to be successful in the 21st century. So it becomes imperative for colleges of education to update their curriculum, so as to provide future teachers with the skills and knowledge necessary to prepare their future students for the 21st century.
Communication is Education and Education is knowledge. This is an age of knowledge exploration and explosion. Rapid progress in computer technology has invaded the arenas of education.

1.2.1 DEFINITIONS OF EDUCATION

“Education is the manifestation of divine perfection, already existing in man” - Vivekananda.

Tagore remarks, “Education means enabling the mind to find out that ultimate truth which emancipates us from the bondage of the dust and gives us the wealth, not of things but of inner light, not of power but of love, making this truth its own and giving expression to it”.

According to Redden’s Definition “Education is the deliberate and systematic influence, exerted by the mature person upon the immature through instruction, discipline and harmonious development of physical, intellectual, aesthetic, social and spiritual powers of the human being, according to individual and social needs and directed towards the union of the educant with his creator as the final end.

1.2.2 AIMS OF EDUCATION

As political, social and economic conditions change and new problems arise, it becomes necessary to re-examine and re-state clearly the objectives which education at each definite stage, should keep in view” – Secondary Education commission.

John Dewey has stated “Acting with an aim is all one with acting intelligently”. The aim makes us to go with a purpose. It stimulates us to see what the out is going to be, even before the end of the activity. The nearer the goal, the more vigorous the efforts for its attainment.

The aim of education keeps both the teacher and taught on the right track. It therefore, does not allow the educational activity to become hazard,
vague and confused without the knowledge of clear cut aim of education is like, “a sailor who does not know his destination and the pupil is like a rudderless vessel which may be drifted somewhere along the shore.”

1.3 EDUCATIONAL TECHNOLOGY

Educational Technology can be conceived as a Science of techniques and methods by which educational goals can be realized, it is not primarily concerned with the task of prescribing the goals. Although, it does help in specifying the goals and translating them into behavioural terms. It is not one particular method of achieving educational goals like that of Montessori or strategy of developing self instructional material, propounded by B.F.Skinner. It is on the other hand a science, on the basis of which various strategies and tactics could be designed for the realization of specified goals. If technology is to serve a blending function a science of learning and in art of teaching, it may also be seen as an attempt to apply the science of education. Silverman (1968) called this viewpoint “Constructive Educational Technology”

1.3.1 DEFINITIONS OF EDUCATIONAL TECHNOLOGY

According to B.C.Mathis “Educational technology refers to the development of a set of systematic methods, practical knowledge for designing, operating and testing in school.”

Robert A.Cox has defined the term educational technology in the following manner “Educational technology is the application of scientific process to mean’s learning conditions to what has come recently to be called Educational Technology”

According to E.E.Haddan “Educational technology is that branch of educational theory and practice where is concerned primarily with the design and use of message which control the learning process.”
1.3.2 SCOPE OF EDUCATIONAL TECHNOLOGY

Educational technology has revolutionized the education system. It has greatly influenced the teaching – learning process. In addition, the following are major advantages of educational technology.

1. It helps in improving the teaching learning process and makes it more purposive.

2. The common man has got television and laptop which can be used for education purpose.

3. The mass education has reduced the standard of education, the use of educational technology can maintain and improve the standard by the use of teaching aids and programmed instruction materials.

4. The correspondence education can be made effective by the use of radio, television, tape record and programmed instruction.

5. Educational administrative problems can be solved scientifically with the help of System Analysis.

6. Educational researches have no impact on the present problem of education because their nature is more theoretical. These have broken open a new field for experimentation for the classroom teaching and training problems.

7. It helps in understanding the structure and nature of teaching. Teaching models can be developed for achieving the different objectives of education

8. Educational technology provides the scientific foundation to education, develops theories of teaching and instruction.
1.4 ROLE OF TEACHER EDUCATORS IN INDIA

The American Commission on Teacher Education (1944) says that “the quality of a nation depends upon the quality of its citizens, the quality of its citizens depends not exclusively but in critical measure, upon the quality of their education. The quality of their education depends more than any other single factor, upon the quality of their teachers.” The quality of the teacher educators in general and those of handling particular subject help the trainees to form and develop favorable attitude towards teaching that particular subject.

The teacher educators have to select the relevant methods of teaching, such as student-centered, activity based, participatory, observation, simulation, learning by doing, play way, inductive, deductive, demonstration, analytic and synthetic method for a specific competency in the subject. As computer enters into the media, it has taken the major role in education for the effective teaching – learning process. Computer – Enhanced Instruction (CEI) refers to using computers to bring new dimensions to the traditional teaching methods.

Hence the teacher educators should understand that the current need of the computer aided instructional techniques to ensure all the teacher trainees receive a quality teacher education and effective practice of the teaching technique.

1.4.1 CHARACTERISTICS OF A GOOD TEACHER EDUCATOR

The best teacher educator shares a unique set of qualities, such as:

a. A desire to educate the young trainees and act as a role model

b. An ability to work with the student teachers from diverse backgrounds and abilities

c. Interest in helping the trainees to learn the methodologies

d. Enthusiasm about a subject
e. Strong interpersonal and organizational skills
f. The ability to work even unsupervised
g. Creativity, energy and patience
h. Digital learning tools and technologies

1.4.2 INSTRUCTIONAL STRATEGIES IN TEACHER EDUCATION

The following instructional strategies are used in Teacher Education at different level.

- Lecture cum demonstration
- Programmed Learning
- Seminar
- Panel discussion and Symposium
- Workshop
- Team Teaching
- Teaching through Audio – Visual aids
- Supervised study
- Field study
- Brain storming

1.5 E-LEARNING – AN INTRODUCTION

Teaching plays a vital role in formal education system. In spite of established sound theories of teaching, it still continues to be a challenging task. Teaching-centre and group-oriented methods of instruction hardly provide for the individual differences of the learners. The term like e-learning is often used to describe an educational program that uses technology such as computer or internet. This term is commonly used by the software industry. The term covers a wide set of applications and processes, such as web-based learning,
computer-based learning, virtual classrooms, and digital collaboration. Increased preservation, reduced learning time are other benefits to the students. There are also particular advantages in e-learning:

- Convenient training to the student
- Self-pacing facility to every learner
- Interactivity engages the users.
- Accessibility to quick reference materials.

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 an answer to the complicated modern, social, economic condition and an exploding population. E-content lesson is generally designed to guide the 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 is facilitating the individualized instruction.

1.5.1 E-LEARNING - DEFINITIONS

E-learning (electronic learning); “A wide set of applications and process such as web based learning, computer based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, Intranet / extranet (LAN / WAN) Audio and Video tape, Satellite, Broadcast, interactive CD-Rom and more.

“E-learning is the effective teaching and learning process created by combining e-digital content with local community and tutor support along with global community engagement.” The teachers role includes the usual dimensions such as developments of curriculum, learning goods and learning resources and facilitation of the learning process.
1.6 E-RESOURCES FOR TEACHING AND LEARNING

The feasibility to use the available resource is more important than its extent of availability. Before the development of computer and internet technology, printed version of resources like books, journals, dictionaries, workbooks, etc. played a significant role in the teaching and learning process. But these printed versions are not easily accessible to all and are also expensive in nature. For example, if two teachers want to refer to a particular book simultaneously, two separate copies of the same book must be available in the library. Whereas if electronic or e-version of the book is available then, the same book can be easily accessed simultaneously by all at the same time. They can also access the book even in their drawing room instead of in the library.

In this age of computer, e-version of books, journals have become inevitable and hence it is very much essential to convert the printed version of the book into e-version for future references. Therefore, knowledge of the different kinds of e-resources, developing e-resources library and preservation of them has become the need of the hour.

1.6.1 TYPES OF E-RESOURCES

Generally, e-resources may be classified into two major types viz,

i. Online e-resources and

ii. Offline e-resources

1.6.1.1 ONLINE E-RESOURCES

The following resources come under the On-line E-resources:

- E-books
- E-journals
- Email
- Gmail
- Sms/mms
• E-library
• E-forum
• E-learning (courses)
• E-shops
• E-dictionaries
• Meta search engines and
• Websites

1.6.1.2 OFFLINE E-RESOURCES

The following resources come under the Off-line E-resources:

• CD ROM based e-resources
• Offline e-dictionaries
• MS Office applications (power point presentation)
• Training software (mouse training)
• E-prompter
• PDF converter
• E-resources on mobile devices

1.6.2 DEVELOPMENT OF E-RESOURCES IN EDUCATION

The development of e-resources requires the fundamental knowledge of the following:

• Basic computer operations
• Internet skills
• Web skills.
1.6.3 ADVANTAGES OF E-LEARNING

- Convenience and the ability to learn at any place where an internet connection is available at one’s own pace.

- Using stimulation based learning content, the learner finds himself in a software environment that is exactly like the real one but which does not carry the same error risk.

- Cost benefits unlike classroom training users may repeat the e-learning course without duplicating the cost.

- It is commonly accepted that the initial cost of an e-learning implementation is expensive (once-off development, cost), but that the cost of training (per use) goes down exponentially as more learners use the e-learning course material.

- E-learning affords people with a range of disabilities easier to learning resources example, students with vision, hearing, speech or mobility impairment and learning or psychiatric disabilities have the opportunity to communicate with their classmates using both better designed mainstream technology available to other without disabilities, and appropriate assistive technology that meets their particular needs. Even those who prefer to deal with the world from a safe and familiar environment at home when unwell may find electronic access to be a beneficial alternative.

E-learning courses use a combination of the following techniques to make learning interesting, interactive and fun they are screen casts, port folios, electronic performance support systems, MP3 players with multimedia capabilities web based teaching materials, multimedia CD-ROMS discussion boards, computer – aided assessment, educational animation, simulations learning management software, electronic voting systems, virtual classrooms etc.
1.6.4 NEED FOR E-LEARNING

E-learning is a teaching and learning approach that combines the best features of the traditional in-class instruction with the communication and resource potential available via the web. E-learning is a technique for teaching and learning that uses the internet to improve student success by enhancing and extending classroom instruction via the web. E-teaching is designed to bring pedagogically successful method for teaching and learning. It ensures interactive engagement (active learning), constructivism and prompt feedback (Formative assessment). It trains the students to take charge of their own learning by providing them with instant feedback and encouraging them to help each other learn.

The essence of e-learning is the feedback loop between the web and the classroom. The faculty use the internet to post the course materials and web-based warm-up assignment before the class and the students use the materials on the web to prepare for each class. The faculty member in turn uses the student responses to create an interactive classroom environment and decreases the use of traditional lecture.

E-learning incorporates the web and intranet based application as well as CD-ROM’s, Satellite channels and Videotapes. The learners like the e-approach because they can learn at their own pace, wherever and whenever they like. Learners can customize their learning to fit their needs and engage in online collaboration learning communities, where they can exchange experiences and access the latest information from around the world and quickly update their skills. Electronic learning or e-learning is delivered straight to the desktop to the learner through an Internet or Intranet connection. Unlike traditional classes, web-based courses can be custom designed, accessed on demand and updated as the need arises. E-learning allows the representatives to study their tasks at their own pace. They can log onto their own web page and spend as little or as much time as needed. The supervisors can check on their progress and update their courses for them.
1.6.5 TYPES OF E-LEARNING

There are fundamentally two types of e-learning:

1. Synchronous training
2. Asynchronous training.

1.6.5.1 SYNCHRONOUS TRAINING

Synchronous training means "at the same time," involves interaction of participants with an instructor via the Web in real time. Asynchronous, which means "not at the same time," allows the participant to complete the WBT at his own pace, without live interaction with the instructor. A new form of learning known as blended learning is emerging. As the name suggests it is an amalgamation of synchronous and asynchronous learning methods.

1.6.5.2 ASYNCHRONOUS TRAINING

Embedded learning is information that is accessible on a self-help basis, 24/7. It can be delivered to the place of work, or to the mobile learners. Electronic performance support system (EPSS) is a type of embedded learning. The advantage is that embedded learning offers the learners the information they need whenever they need it.

Discussion Groups

A discussion group is a gathering of conversations that occur over time. They are also called message boards, bulletin boards and discussion forums. Discussion groups can be used to support a group of participants taking the same class or can be used to support the participants performing the related tasks. A discussion group is a very competent way to supply expert answers to a large group people. A single answer to a common question can help many.
**Virtual Classroom**

Virtual classroom duplicates the features of a real classroom online. The participants interact with each other and the instructors online instant messaging, chat, audio and video conferencing etc.

**Blended Method**

Most companies prefer to use a mix of both synchronous and asynchronous e-learning methods according to their requirement.

**1.6.6 SCOPE OF E-LEARNING**

E-learning makes learning, interactive and fun. It has the right blend of content (instruction) and cutting-edge technologies that offer the best benefits. E-learning is becoming an important part of education and it can provide new possibilities for the disabled people to support their different learning styles and paces. E-learning holds for those with disabilities with its capacity to support different learning styles and paces.

A combination of appropriate e-learning methods and assistive technologies can help the persons with disabilities to overcome the barriers by offering them the possibility to learn at their own pace from their homes and almost about everything they can imagine. E-learning technologies have the potentials to improve learning opportunities for the students with disabilities.

E-moderators and disabled students need new skills to embrace e-learning. These include presenting information in new ways, navigating and utilizing the benefits of web and engaging in computer mediated conferencing. Leading edge advances, in both the computer operating systems and assistive technology provides the students with disabilities new opportunities for fulfillments in educational programmes.
1.7 E-CONTENT – A GENERAL VIEW

E-content comprises all forms of electronically supported learning and teaching. The information and communication systems, whether networked or not, serve as a specific media to implement the learning process. E-learning is essentially the computer and network enabled transfer of skills and learning. E-learning is essentially the computer and network enabled transfer of skills and learning. E-learning applications and process include web based learning; computer based learning, virtual classroom opportunities and digital collaboration. Contents are delivered via the internet, intranet / extranet, audio or video tape, satellite TV and CD Rom. It can be self paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

In education e-learning is available at the time a learner needs it in order to perform a task, rather than only at the time a provider wants to make it available. E-learning is an emerging educational paradigm where the learners identify especially what they had to learn and access it quickly from a wide variety of educational providers instead of taking the whole courses from the location of the educational institutions on their fixed schedule. Ideally, e-learning is the exact content and delivery method that the learner needs and its is available at the time and place the learner needs it. E-learners get the right knowledge from the right person at the right time, when it is needed, not weeks or months later, E-learning helps learners stay on top of today’s fast-paced education world.

The current academic system of courses, credit and evaluation methods is increasing too widely to meet learners needs. The courses are large blocks of content, a learner often only needs small parts of that content and they are increasingly able to get what they need from other providers in an e-teaching classroom actively work on their knowledge of specific concepts during the class by not only discussing warm up responses, but also working on solving problems in a group setting. E-teaching is currently being used in the teaching
of various subjects like Biology, Geology, Chemistry, Psychology and Mathematics as well as in nursing, history, economics and anthropology.

E-learning offers students and teachers the opportunity to engage in electronically mediated interaction with each other and with learning materials. Learning resources (print-based, graphical, audiovisual media) are largely made available electronically, either online or via CD-Rom. Participants can access designated.

Greg Kearsley (1997) defines e-learning as “online education or e-learning allows the study of higher education courses through the electronic medium of internet. Course materials, including reference papers, study materials and contact with the tutors and fellow students are all accessed through the use of personal computers and telecommunications.”

A comprehensive definition from the Department of Education, Training and Employment is “e-learning are conducted through the internet, allowing the participants to receive and submit coursework and interact with the participants and the professors via computer and modem. The predominantly asynchronous nature of the lessons, activities and communication methods allows the students to participate in the courses at times and places convenient to us”.

E-learning can be used by the learners in traditional, face-to-face educational settings or at a distance as they connect from home, workplace, internet cafes or public libraries. Website conduct their own search of the internet interaction between the learners and teachers and among the learners is achieved using individual e-mail and its group variants e.g. list servers and computer mediated conferencing. Discussion occur synchronously (at designated times) or asynchronously as the participants read, contributes from others and make their own over a longer time span.
1.7.1 DEFINITION OF E-CONTENT

Electronic content (e-Content) or digital content is defined by those involved in creating, providing and distributing information as the digitalised content, which is viewed on screen and not on paper. Contents that are produced and stored electronically rather than in print are the result of electronic publishing (e-publishing). The contents can be in any of the following forms:

- any one information type (for example fully textual, only graphics content, or only audio content);
- Multimedia or hypermedia (i.e. mixing more than two information types).

E-Contents use in education can be from the usual electronic journals (e-Journals), and electronic books (e-Books) to electronic research reports (e-Research-reports), electronic lecture modules (e-Lecture-modules), electronic lecture notes (e-Lecture-notes) and electronic lecture slides (e-Lecture-slides).

1.7.2 MEANING OF E-CONTENT

In a today’s world the application of ICT has become a modern day necessity in various spheres of activities ranging from livelihood, entertainment, science to education, health and environment. The fact is living perspectives have drastically changed in all critical areas through ICT involvement and use. In this the use of Internet and latest technological innovations are ruling the roost in deciding our taste and necessity in all diverse areas. E-learning is one such vital segment that has come up wholeheartedly to mould the learning modules and mechanisms not only in academic terms but also in other areas of practical applications in livelihood and empowerment. No doubt the role of content, nay digital content, assumes critical necessity and value to boost and spread the e-learning use and utility.
E-content is valuable to the pupil and also helpful to the teachers of all individual instruction systems; E-content is the latest method of instruction that has attracted more attention to gather with the concept of models. The ultimate aim of the E-content is to abolish the disparity among the learners through effective education. The research is investigating the impacts of E-content. This paper intends proposed method of E-content, Stages of New ADDTIE Model which include Analysis, Design, Development, Testing, Implementation and Evaluation. This paper concluded that E-content helps to quality of the material to all level of learners. As a result, quality of effective education is possible.

1.7.3 UNDERSTANDING OF E-CONTENT

E-content is the core of any single or multi-media application, whether commercial or not. Practically almost any website, CD, video, or mobile application is built to carry the content to the user or to help the user create his/her own content. E-content today is mostly viewed as a way to preserve and carry forward cultural or historical heritage, to disseminate lifestyle, scientific, educational and business information in some digitalized format, or to provide some interactive service to the users. Importantly, user-created content is also included in any e-content definition.

E-content is digital information delivered over network-based electronic devices, i.e., symbols that can be utilized and interpreted by human actors during the communication processes, which allow them to share visions and influence each other’s knowledge, attitudes or behaviour. E-content allows for user involvement and may change dynamically according to the user’s behaviour. It is a subcategory both of digital and electronic content, marked by the involvement of a network, which leads to a constant renewal of the content (contrary to the fixed set of content stored on a carrier such as a CD-ROM, or the content broadcast via TV and Radio). This constant renewal of the content in tie with its dynamic change allows for a qualitative difference, thus making it e-Content.
The spread of e-content is complete with the creation and delivery of e-content in various essential categories. E-learning is one vital category for e-content interventions and delivery. By now various methods of content delivery and innovations have sprung up in e-learning.

1.7.4 E-CONTENT AND E-LEARNING ACROSS THE WORLD

Use of ICT in education or in that case growth and development of e-content for e-learning is at various stages of development and application. Countries and societies are on continuous drives to make a viable platform for e-learning through effective and utility based content structure and delivery. Gradually social structures and institutions are being moulded to see the effectiveness and viability of having e-learning modules and practices for multiple gains. For this there is continuous search for value based content across societies and institutions.

The target is to enrich upon the existing knowledge driven society. In Brazil universities are investing to supply improved teaching and learning resources via digital media. E-learning is the most developed aspect of e-content in Jordan.

1.7.5 MODELS OF E-CONTENT DEVELOPMENT

The e-content development models are available in five different ways and they are as follows; An instructional design model by Kemp (1977) defined nine different components and adopted a continuous update with evaluation; (ii) teaching of media in a systematic approach model by Vernon & Donald (1980) compared the different instruction design models; (iii) A Systematic Design of Instruction model by Dick &Carey (1990) described all the phases of process starts with instructional goals and ends with summative evaluation; (iv) Systems Reusable Information Object Strategy by CISCO (1999) consists of six content items viz., introduction; importance; objectives; pre-requisites; scenario; and outline with Learning Management System (LMS) and (v)Content based model by Cernea (2005) explained the learning objectives of a content and the content’s
accessibility and reusability between various Learning Content Management System (LCMS).

1.7.6 PHASES OF E-CONTENT DEVELOPMENT

In e-content development aspects consists of six phases viz., analysis, design, development, testing, implementation and evaluation.

THE ANALYSIS PHASE

It is the most important as it identifies area’s in our current situation. This phase accountability is considered by the views of subject experts, target audiences, objectives and its goals. In this phase, we must know the audience, and their skill, budget of the e-content, delivery methods and its constraints with due dates.

THE DESIGN PHASE

It involves the complete design of the learning solution. It helps to the plan of an e-content preparation. In this phase, we must know the planning, use of relevant software; required skills; creative and innovative interactions of subject contents like texts, pictures, videos and suitable animations.

THE DEVELOPMENT PHASE

It concerns the actual production of the e-content design. It helps to create the e-content by mixing of texts, audio, video, animations, references, blogs, links, and MCQs (multiple choice questions) with some programming specifications like home, exit, next etc.

THE TESTING PHASE

It helps to administer the e-content in the actual educational field. In this phase, we must test the spelling mistakes, content errors, clarity of pictures, relevant videos, appropriate audios, timing of animations, and hyperlinks.
**THE IMPLEMENTATION PHASE**

It helps to administer the e-content to the target audience. This phase explains how to install and how to use it and their difficulties experienced while using e-content. It checks the product accuracy and quality maintenance.

**THE EVALUATION PHASE**

It helps to satisfy the e-content and its effectiveness. This phase considers feedback from both the learners and instructors. After the feedback reactions, the e-content is designed again as the post-production for effective delivery of e-content.

**1.7.7 PEDAGOGICAL ISSUES IN E-CONTENT DEVELOPMENT**

Pedagogy describes the collected practices, processes, strategies, procedures, and methods of teaching and learning. It also includes knowledge about the aims of instruction, assessment, and student learning. The challenges of pedagogical issues in e-content are; (i) to make the knowledge visible to the learners; (ii) to make the teachers’ thinking visible to the learners and (iii) to make the learners’ thinking visible to themselves, their peers, and the teacher. The pedagogy has evolved largely as the product of pragmatic constraints (e.g. time, class size, linear text books). Planned e-content packages have overcome many of these constraints including dictionaries, references and links.

A digital text and images designed for display on web pages which is suitable for a particular audience is called as ‘e-content’. It means, any content product available in a digital form and it typically refers to music, information and images that are available for distribution on the electronic media. (Anurag Saxena, 2011)

In e-content development process needs several aspects. The content should follow appropriate instructional design methodology in order to assure meeting of the learning objectives and expected outcomes. The effort spent in
content preparation should be re-usable across the various learning management systems. All the e-content materials are focused on

a. *Cognitive perspective:* it focuses on the cognitive processes involved in the learning as well as how the brain works;

b. *Emotional perspective:* it focuses on the emotional aspects of learning, like motivation, engagement, fun, etc.;

c. *Behavioural perspective:* it focuses on the skills and behavioural outcomes of the learning process, role-playing, settings of job and

d. *Contextual perspective:* it focuses on the environmental and social aspects which can stimulate learning.

1.7.8 **INSTRUCTOR’S ROLE IN THE DEVELOPMENT OF E-CONTENT**

A competent instructor in e-content is, one who effectively and efficiently accomplishes a task in a given digital context, using appropriate knowledge, skills, attitudes, and abilities that have adjusted with in a time and their needy competencies. Also International Board of Standards for Training, Performance and Instruction organization developed the standard competencies for the instructors in e-content development in the following domains:

a. Professional foundations,

b. Planning and preparation,

c. Instructional methods and strategies,

d. Assessment and evaluation, and

e. Management.
The following diagram illustrated the development of a multimedia material

1.7.9 Characteristics of E-Content Development

According to Anurag Saxena (2011), he explained the possible methods of educational e-contents conversions are viz., (i) learning by doing and learning by investigation; (ii) learning by using themes; (iii) learning by testing / evaluation; (iv) learning by simulation, and (v) learning by role-playing. As per the UGC (University Grants Commission, India) guidelines of e-content development needs the following categories viz., (i) home; (ii) objectives; (iii) subject mapping; (iv) summary; (v) text with pictures & animations; (vi) video and audio; (vii) assignments, quiz & tutorial; (viii) references, glossary & links; (ix) case studies; (x) FAQs; (xi) download; (xii) blog and (xiii) contact. These categories are arranged sequentially by the subject experts along with technical supporters so as to develop the e-content materials.

E-learning is a process and E-content is a product. E-content is generally designed to guide the students through a lot of information in a specific task. An e-content package can be used as a teacher in the virtual classroom situations. The quality of learning depends not only on the form of how the process is carried out but also on what content is taught and how the content is presented. This approach of teaching has become an answer to the complicated problems and un-identified areas.

In a classroom, technology stimulates the learner and gets the learner involved in the learning. Books are an extension of brain; video is an extension of eye; audio is the extension of an ear; audio conferencing is the extension of mind & vocal chord; computer is an extension of fusion on mind, hands & eyes; satellite technology is an extension of human reach and computer network is an extension of human co-operation. So what we would expect from e-contents is that it should be able to stimulate the learner in such a way that utilizes the maximum of its potential in learning.
E-content is valuable to the pupil and also helpful to the teachers for all individual instruction systems; e-content is the latest method of instruction that has attracted more attention to gather with different concepts. The ultimate aim of the e-content is to abolish the disparity among the learners through effective education. E-content is facilitating to the teacher to an effective manner. It is enhancing the learner knowledge level which leads to creative thinking and it gives the future ideas on the basis of given links, and references.

1.7.10 CHALLENGES IN E-CONTENT

As stated, e-learning and content are inseparable and the former rely on the latter. Content and e-learning faces a number of challenges in coming out with viable modules for information enriched society and institutions. In fact, most of the challenges in e-content in developing societies aptly apply to e-learning challenges as well. These include:

- Lack of basic ICT infrastructure like telephone, power supply and Internet connectivity
- Lack of computer knowledge and training among the majority of people
- High costs of ICT equipments including computers which hinders access to ICT due to financial issues
- Lack of knowledge of ICT and its application
- Absence of a sound ICT policy initiatives in the form of tax incentives, abolition of tariffs or certain taxes and on IT equipments
- Low broadband penetration as a bottleneck for development of media-rich e-content
- Low level of investments in the production of learning and educational programs and materials
- Less development of user friendly applications
• Risk prone cultural and commercial culture in many societies toward technical innovations and applications

• Not enough political and administrative support in many countries

• Lack of strategic vision of information society development

• Absence of adequate legislative framework for deployment of information society

• Absence of coordination between the state and public organizations in the area of content framework and overall info society.

1.7.11 ADVANTAGES OF E-CONTENT IN HIGHER EDUCATION

Many higher education (HE) institutions publish books, research reports, lecture modules, theses and other information for academic purposes. All these publications are usually in-print form and stored in the university’s library for the fellow lecturers, researchers and students use.

Are there compelling reasons why these in-print publications should be in electronic form? To answer this it is necessary to identify the advantages and disadvantages of printed content (p-content) and e-content. According to Bonime and Pohlmann, (1998) e-contents benefit from:

• hyperlinking - contents can be linked to other pages inside and outside the book;

• non-linearity - i.e. the order of access can be determined by the users.

• addition of multimedia - i.e. content presentation is enhanced by the mixing information type (i.e. sound, video and so on);

• data density - storage capacity is decreased while at the same time there is an increasing portability;
searching - the usefulness of the content is enhanced by the ability of the users to locate any piece of information, or to access any section instantly.

A comparison of paper book and electronic book features (see Table 1.1) provided by Bonime and Pohlmann and Rawlins can be used as a guideline when considering the possibility of converting printed information to e-content.

Table 1.1

Features comparison of p-content and e-content

<table>
<thead>
<tr>
<th>Features</th>
<th>p-content</th>
<th>e-content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tactile</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Portable</td>
<td>Yes</td>
<td>Yes &amp; No</td>
</tr>
<tr>
<td>Access without devices</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Easy random access</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Multiple access at one time</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Customisable (font size, annotations etc.)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hyperlinks</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Text</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pictures</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Audio</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Animation/video</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Instant search facility</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Easily and conveniently read</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Easily damaged (i.e. tear)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Content updated easily</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Go out of print</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Highly interactive</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Good legibility</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Easily reproduced with the same quality</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
It is a well established fact that the process of e-learning is endowed with a lot of advantages, of which the same are not at all available in the human-enabled teaching and learning process. People enlist a lot of advantages and benefits of e-learning. Some of the important advantages of e-learning are; it is not just learning but sharing, the content in the e-content is not static rather dynamic, it is anywhere and anytime learning, it has a global audience, the content to be delivered through the process of e-learning has certification, it is indeed damn cheap, the instructional design in e-content will be learner centric, it invites structured feedback, it is self paced, it can be used in real time and many time, it can present the content through multimedia presentation, it will have Scientific evaluation method, the content would be authentic, and it may have the provisions like interactivity, Book marking, white board, Hot spot, Hypertext and Hyperlinks etc.,

Apart from these, the e-content presents the content in multiple formats; complete technical contents are explained with suitable graphics and animations. The e-content is generally in self directed and paced instructional format and smooth instructional strategies are chalked out in such a way that learners never lose the interest. It presents the content in a simple text with unambiguous graphics and with relevant supportive headings. Sometimes, it has its own reference materials which generally do not burden the learners and those can appear on demand with optional frames. Some e-content have certain striking features like automatic retaking of the lessons. Wherever learners are not satisfactorily able to perform, it may have automatic learning path. Sometimes, it offers room for selection of the quantum of information considering the learners requirements. Some advance level e-content provide 3D virtual reality-synchronous and asynchronous interactivity – chat, conferencing, etc.,

The above details establish that e-learning is a mixture of different learning methods, delivered to the learners through information technology supported with educational instructional design and relevant content. The e-
learning is, as a universe, comprising of three basic elements viz. 1.Content 2.Services and 3.Technology.

The content forms the back bone of the e-learning, services and technology forms the rider on which the content travels.

1.7.12 NEED FOR A VIALBE CONTENT STRUCTURE

Development and spread of e-learning networks across societies, especially the underdeveloped and developing countries, call for urgent attention on certain key issues. The following issues stand significant in determining the e-learning status of societies together with the overall e-content structure:

- A clear ICT policy from the government
- A proactive policy for bridging the digital divide
- Allow financial incentives in ICT interventions including in e-learning ventures
- Enhance ICT awareness and spread in communities and people
- Incentive academic courses on ICT across the countries and societies
- Environment for developing e-learning solutions that is feasible, accessible and utility based
- Effective public-private partnerships in the promotion of e-learning content ventures in schools and institutions
- Ease of access of content online and through other communications technology
- Development of proper and effective e-learning software through effective course delivery and content
• Continual advances in value addition through the use of latest applications such as educational animation to be made available to support online learning

• Open source e-learning systems such as Blackboard, Model, A Tutor, ILIAS, need to be used effectively towards a student-centred learning solution.

1.8 MATHEMATICS

Mathematics is an accepted science and space which deals with the quantitative aspects of our life and knowledge. (S.K.Mangal, 1989)

Mathematics has its own language, its own tools and mode of operations. Mathematics is taken as a chest filled up with so many valuable tools concerning with the operations like measuring, weighing, counting etc. and helps in proper understanding of the natures work and complicated problems of life by converting them into its language of signs and symbols. Mathematics helps us in solving the problems of life needing numerations and calculations. It provides opportunity, for the intellectual gymnastic of man’s inherent powers. Mathematics is an exact Science and involves high cognitive abilities and powers.

1.8.1 MEANING AND DEFINITION OF MATHEMATICS

"Mathematics is the subject which provides an opportunity for the training of mind to close thinking, stirring up a sleeping and unstructured spirit". - Plato

Etymologically the term ‘Mathematics’ is derived from two Greek words: ‘Manthanein’ which means ‘learning and ‘Techne’ which means ‘an art or technique’. The dictionary meaning of mathematics is that ‘it is either the science of number and space or the science of measurement, quantity and magnitude’. Mathematics is thus defined as the science of quantity, measurement and spatial relations. It is a systematised, organised and exact
branch of science. It deals with quantitative facts, relationships as well as with problems involving space and form. It is a logical study of shape, arrangement, and quantity. Mathematics is defined in different ways by different authors. Let us examine a few of them.

According to new English Dictionary - "Mathematics - in a strict sense - is an abstract science, which investigates deductively, the conclusions implicit in the elementary conceptions of spatial, numerical relations."

The dictionary meaning of mathematics is that ‘it is either the science of number and space or the science of measurement, quantity and magnitude’. Mathematics is thus defined as the science of quantity, measurement and spatial relations. It is a systematised, organised and exact branch of science. It deals with quantitative facts, relationships as well as with problems involving space and form. It is a logical study of shape, arrangement, and quantity. Mathematics is defined in different ways by different authors. Let us examine a few of them.

According to Locke - "Mathematics is a way to settle in mind a habit of reasoning".

According to Lindsay "Mathematics is the language of physical sciences and certainly no more marvelous language was ever created by the mind of man".

According to Courant and Robbins - "Mathematics is an expression of human mind that reflects the active will, the contemplative reason and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality".

According to Servais - "Mathematics is an abstract science - it is the science of abstraction. Learning mathematics is learning to abstract, to handle abstractions and to use it. "

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According to Higgins - "Mathematics is a laboratory subject. The power and advantage of mathematics lie not in concrete manipulations, but in abstract symbolic manipulations which is always the final goal that we seek”.

Bertrand Russell defined mathematics as “The subject in which we never know what we are talking about, nor whether what we are saying is true”, is fundamentally significant. Bell, discussing the merits of this definition in his “Queen of Sciences” says that,

(i) It emphasises the entirely abstract character of mathematics
(ii) It reduces all mathematics to postulation forms, and
(iii) It opposes the traditional definition of mathematics as the science of number, quantity and measurement”.

Comte defined mathematics as “The science of indirect measurement”

According to Kant “Mathematics is the indispensable instrument of all physical researches”

Gauss stated “Mathematics is the queen of sciences and arithmetic is the queen of all mathematics”

Bacon said “Mathematics is the gateway and key to all sciences”

J.B. Shaw stated, “Mathematics is engaged, in fact, in the profound study of art and the expression of beauty”.

According to Shaw there are four significant methods of mathematics which give more insight into the nature of mathematics.

• Scientific, leading to generalisations of widening scope.

• Intuitive, leading to an insight into subtler depths.

• Deductive, leading to a permanent statement and rigorous form.

• Inventive, leading to the ideal element, and creation of new realms.
Mathematics, therefore, is not only ‘number work’ or ‘computation’, but is more about forming generalisations, seeing relationships, and developing logical thinking and reasoning.

The National Policy on Education (NPE) (1986) stated “Mathematics should be visualized as the vehicle to train a child to think, reason, analyse and to articulate logically”. Mathematics should be shown as a way of thinking, an art or form of beauty, and as human achievement.

Thus, from above definitions, we can conclude that

i) Mathematics is an abstract Science.

ii) Mathematics is a science that deals with number and space.

iii) Mathematics deals with quantitative facts and relationships.

iv) Mathematics deals with problem involving space and form.

v) Mathematics establishes various relationships between phenomena in space.

vi) Mathematics helps man to give exact interpretation to his ideas and conclusions.

vii) Mathematics explains that Science is a by-product of our empirical knowledge.

viii) Mathematics involves man's high cognitive powers.

ix) Mathematics has its own tools like intuition, logical reasoning, analysis, construction, generalities and individuality.

x) Mathematics is a Science of Logical – reasoning

xi) Mathematics is a tool especially suited for dealing with scientific concepts.
1.8.2 IMPORTANCE OF MATHEMATICS

In today's world, we are bombarded with data that must be absorbed, sorted, organized, and used to make decisions. The underpinnings of everyday life, such as making purchases, choosing insurance or health plans, and planning for retirement, all require mathematical competence. Business and industry need workers who can solve real-world problems, explain their thinking to others, identify and analyse trends in data, and use modern technology. As society becomes more technically dependent, there will be an increasing requirement for people with a high level of mathematical training.

Mathematics is a universal part of human culture. It is the tool and language of commerce, engineering and other sciences – physics, computing, biology etc. It helps us recognise patterns and to understand the world around us.

Furthermore, learning mathematics forces us to learn how to think very logically and to solve problems using that skill. It also teaches us to be precise in thoughts and words. Math teaches life skills. It is difficult to find any area of life that isn't touched by mathematics.

Today's students must master advanced skills in mathematics, science, and technology to stay on track for college and for promising careers. Mathematics teaches us ways of thinking that are essential to work and civic life.

Teachers play an important role in fostering mathematics skills. Mathematical education is based on the twin premises that all students can learn mathematics and that all students need to learn mathematics. It is therefore imperative that mathematics education is of the very highest quality to all children.
1.9 MATHEMATICS EDUCATION

In contemporary education, Mathematics Education is the practice of teaching and learning mathematics, along with the associated scholarly research.

Researchers in mathematics education are primarily concerned with the tools, methods and approaches which facilitate the study of practice. However mathematics education research, known on the continent of Europe as the pedagogy of mathematics, has developed into an extensive field of study, with its own concepts, theories, methods, national and international organizations, conferences and literature.

Everybody needs some knowledge of Mathematics in one way or the other. There is a definite need of Mathematics for everybody’s life-long and day-to-day planning. A mathematical approach is essential for the progress of all activities. Any approach without mathematical considerations is a failure.

Teaching mathematics is a task which, if sincerely undertaken, will challenge the best efforts of the best teacher. There are two equally important aspects of any true profession viz., significant knowledge and effective techniques. One cannot be efficiently professional if there is any serious weakness in either of the two.

1.9.1 IMPORTANCE OF MATHEMATICS TEACHING

Mathematics, by virtue of its extensive practical applications and aesthetic appeal of its methods and results has long held a prominent place in human life. Today human being depend upon Mathematics for day-to-day functioning. Mathematical knowledge is indispensable in understanding and controlling the forces of nature. Mathematics is at the base of all essential knowledge and is the basis of the progress of science, technology, economy, production and the society in general.
Mathematics is active everywhere in our human society. From the hurried arithmetic that we perform in our daily lives to the exacting calculations of science and technology, Mathematics shapes and influences nearly every object around us. Every student should be aware of the interrelationships between the development of Mathematics and the development of society itself. It can be provided in an effective and systematic manner only by teaching Mathematics in the schools. The world has now recognized the importance of Mathematics and it is generally accepted that some knowledge of Mathematics is an important part of liberal education.

The teaching of Mathematics has got some special significance, especially in schools where a child lays the foundation for his future. The teaching of Mathematics can be made more and more interesting, so that a good number of students may incline towards the study of Mathematics. The whole society accepts the importance of Mathematics.

1.9.2 METHODS OF TEACHING MATHEMATICS

After deciding ‘why to teach ’and ‘what to teach’, it is proper to think about ‘how to teach’. ‘How to teach’ is a really difficult problem for the teacher. Teaching is an art. Methods are the ways to understand and practice the art. A mathematics teacher has a variety of methods and techniques available for use in the teaching of mathematics.

The selection of suitable method depends upon

- the objectives of the lesson,
- needs of the learner and
- nature of the content.

Therefore the knowledge of procedures, merits and demerits of all the methods will broaden the outlook of a student-teacher. Then the student-
teacher can decide from his wide information, which of the methods to use and when.

1.9.3 TECHNOLOGY IN MATHEMATICS EDUCATION

Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and improves students learning. To elaborate further, it says that “the existence, versatility, and power of technology make it possible and necessary to reexamine what mathematics students should lean as well as how they can best learn it” (National council of teachers of Mathematics, 2000). Advancements in technology occur daily and the users have several choices from video to the multimedia and to the internet. Innovative use of technology can improve the way mathematics should be taught and improves students understanding and visualization of the basic concepts (Wan, Afza, 2006). Furthermore, visualization is a means for the learners to construct mathematical knowledge and meaning in mathematics education.

1.9.4 MULTIMEDIA AND MATHEMATICS INSTRUCTION

Mathematics is a difficult subject. Multimedia technologies have a wide impact on the teaching of mathematics. Whereas Multimedia teaching can facilitate in depth exploration of mathematical topics, previously what was considered as too complex for typical classroom in particular when such topics involve real world “messy-data”. Multimedia enables students to visually examine the concrete representation of mathematics concept. For example in using the graphing calculator, the analysis of the calculator images would provide the students with a concrete learning, gives opportunity to recognize their thinking processes, procedures and structure thereby enabling them to move towards a higher formalized level of understanding.

The National Council of Teachers of Mathematics (NCTM) has argued even more persuasively in support of the use of computing technologies in the
classroom. “Electronic technologies – calculators and essential tools for teaching, learning and doing of mathematics. They furnish visual images of mathematical ideas, they facilitate organizing and analyzing data and they compute efficiently and accurately. They can support investigation by the students in every area of mathematics, including geometry, statistics, algebra, measurement and numbers. When technological tools are available, students can focus on decision making reflection, reasoning and problem solving (NCTM 2000)”.

Research in mathematics education over the last decade has begun to address the nature of these new technologies and their effects on learning and teaching. Although overall findings concerning the predicted benefits for students’ learning have been somewhat inconclusive, many studies have reported that the use of technology has a positive effect on students’ attitudes towards mathematics, understanding of function and graphing concepts and spatial visualization skills.

1.10 SIGNIFICANCE OF THE STUDY

The advancement in electronic media forces the teachers to change their traditional methods of teaching. The role of the teacher is also changing. Students need E-guru to explain the wealth of information available on-line. In short, with technological advancements the role of the teacher is more than that of facilitator, guide and resource seeker.

Today's classroom teachers must be prepared to provide technology-supported learning opportunities for their students. Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher's professional repertoire.

The use of E-content is changing teaching in several ways. With E-content, teachers are able to create their own material and thus have more control over the material used in the classroom than they have had in the past.
Mathematics equips people with a uniquely powerful set of tools to understand and change the world. These tools include logical reasoning, problem solving skills and the ability to think in abstract ways. At the same time, teaching of mathematics is challenging because many of the concepts are abstract and most mathematical problems require specific methods for the understanding of the abstract concepts. So, the mathematics teachers should use the apt teaching methods in the classroom that will ultimately enable the students to apply mathematical skills independently. For effective teaching to take place, a good method must be adopted by a teacher. A teacher has many options when choosing a style by which to teach. When deciding the teaching method to be used, a teacher needs to consider the students' background knowledge, environment, and learning goals.

E-content is a very powerful tool of education. E-content is valuable to the learners and also helpful to the teachers of all individual instruction systems; E-content is the latest method of instruction that has attracted more attention to gather with the concept of models. The individualized instruction through e-content helps the heterogeneous group of students to learn themselves at their own pace depending upon their ability and also reduce the teachers work load of instruction in the classroom.

E-content can greatly aid the process of mathematical exploration and clever use of such aids can help the student-teachers to understand various methods available in teaching of mathematics education. Innovations like e-content and use of such material must be encouraged so that their use makes learning mathematics more enjoyable and meaningful.

Hence with the intention of developing E-content and testing its efficiency, the investigator conducted a study on “EFFECTIVENESS OF E-CONTENT IN TEACHING OF MATHEMATICS EDUCATION AMONG B.ED STUDENT-TEACHERS”.
1.11 TITLE OF THE STUDY

“Effectiveness of E-content in Teaching of Mathematics Education among B.Ed. Student-Teachers”

1.12 OPERATIONAL DEFINITION

1. EFFECTIVENESS

According to Oxford Advanced Learner’s Dictionary of current English by A.S.Hornby (OUP, 1984) “Effective” means the power to bring about a result. As far as the study is concerned, effect refers to impressive results in the learning of Methods of Teaching Mathematics by the B.Ed students consequent upon the operation of E-content. The effectiveness is determined in terms of the gain scores obtained by the students in the experiment. The gain score is obtained by subtracting the pre-test score from the post-test score.

2. E-CONTENT

Electronic content (E-content) or digital content is defined by those involved in creating, providing and distributing information as the digital content, which is viewed on screen and not on paper.

3. TEACHING OF MATHEMATICS EDUCATION

Teaching of Mathematics Education is the practice of teaching and learning mathematics.

4. B.ED. STUDENT-TEACHERS

B.Ed. Student-teachers refer to the who are undergoing training for the profession of teaching (Bachelor of Education). In this study, B.Ed. Student-teachers refer to the student-teachers who belong to mathematics department.
1.13 Objectives

1.13.1 Major Objectives of the Study

• To find the effectiveness of E-content in the Teaching of Mathematics Education among the B.Ed student-teachers”.

• To find the Attitude towards E-content in the Teaching of Mathematics Education among the B.Ed student-teachers”.

1.13.2 Specific Objectives of the Study

1. To find the mean score of the control group in the pre-test.

2. To find the mean score of the control group in the post-test.

3. To find the mean score of the experimental group in the pre-test.

4. To find the mean score of the experimental group in the post-test.

5. To find the significance of difference between the control and the experimental group B.Ed student-teachers in their pre-test mean scores.

6. To find the significance of difference between the pre-test and the post-test mean scores of control group.

7. To find the significance of difference between the pre-test and the post-test mean scores of experimental group.

8. To find the significance of difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores.

9. To find the significance of difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores with reference to the knowledge level objectives.
10. To find the significance of difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores with reference to the understanding level objectives.

11. To find the significance of difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores with reference to the application level objectives.

12. To find the significance of difference between below average student-teachers of the control and the experimental group in their post-test mean scores.

13. To find the significance of difference between below average student-teachers of the control and the experimental group in their post-test mean scores with reference to the knowledge level objectives.

14. To find the significance of difference between below average student-teachers of the control and the experimental group in their post-test mean scores with reference to the understanding level objectives.

15. To find the significance of difference between below average student-teachers of the control and the experimental group in their post-test mean scores with reference to the application level objectives.

16. To find the significance of difference between average student-teachers of the control and the experimental group in their post-test mean scores.

17. To find the significance of difference between average student-teachers of the control and the experimental group in their post-test mean scores with reference to the knowledge level objectives.

18. To find the significance of difference between average student-teachers of the control and the experimental group in their post-test mean scores with reference to the understanding level objectives.
19. To find the significance of difference between average student-teachers of the control and the experimental group in their post-test mean scores with reference to the application level objectives.

20. To find the significance of difference between above average student-teachers of the control and the experimental group in their post-test mean scores.

21. To find the significance of difference between above average student-teachers of the control and the experimental group in their post-test mean scores with reference to the knowledge level objectives.

22. To find the significance of difference between above average student-teachers of the control and the experimental group in their post-test mean scores with reference to the understanding level objectives.

23. To find the significance of difference between above average student-teachers of the control and the experimental group in their post-test mean scores with reference to the application level objectives.

24. To find the significance of difference between the pre-attitude and post-attitude scores of the control group student-teachers.

25. To find the significance of difference between the pre-attitude and post-attitude scores of the experimental group student-teachers.

26. To find the significance of correlation between the gain scores and the pre-attitude scores of the control group student-teachers towards E-content in the Teaching of Mathematics Education.

27. To find the significance of correlation between the gain scores and the pre-attitude scores of the experimental group student-teachers towards E-content in the Teaching of Mathematics Education.
28. To find the significance of correlation between the gain scores and the post-attitude scores of the control group student-teachers towards E-content in the Teaching of Mathematics Education.

29. To find the significance of correlation between the gain scores and the post-attitude scores of the experimental group student-teachers towards E-content in the Teaching of Mathematics Education.

30. To identify the effect size for the difference between the means of pre-test and post-test score mean in E-content in Teaching of Mathematics Education.

31. To judge the gain ratio obtained through E-content in Teaching of Mathematics Education among B.Ed. student-teachers.

1.14 NULL HYPOTHESES

1. There is no significant difference between the control and the experimental group B.Ed student-teachers in their pre-test mean scores.

2. There is no significant difference between the pre-test and the post-test mean scores of control group.

3. There is no significant difference between the pre-test and the post-test mean scores of experimental group.

4. There is no significant difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores.

5. There is no significant difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores with reference to the knowledge level objectives.

6. There is no significant difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores with reference to the understanding level objectives.
7. There is no significant difference between the control and the experimental group B.Ed student-teachers in their post-test mean scores with reference to the application level objectives.

8. There is no significant difference between below average student-teachers of the control and the experimental group in their post-test mean scores.

9. There is no significant difference between below average student-teachers of the control and the experimental group in their post-test mean scores with reference to the knowledge level objectives.

10. There is no significant difference between below average student-teachers of the control and the experimental group in their post-test mean scores with reference to the understanding level objectives.

11. There is no significant difference between below average student-teachers of the control and the experimental group in their post-test mean scores with reference to the application level objectives.

12. There is no significant difference between average student-teachers of the control and the experimental group in their post-test mean scores.

13. There is no significant difference between average student-teachers of the control and the experimental group in their post-test mean scores with reference to the knowledge level objectives.

14. There is no significant difference between average student-teachers of the control and the experimental group in their post-test mean scores with reference to the understanding level objectives.

15. There is no significant difference between average student-teachers of the control and the experimental group in their post-test mean scores with reference to the application level objectives.
16. There is no significant difference between above average student-teachers of the control and the experimental group in their post-test mean scores.

17. There is no significant difference between above average student-teachers of the control and the experimental group in their post-test mean scores with reference to the knowledge level objectives.

18. There is no significant difference between above average student-teachers of the control and the experimental group in their post-test mean scores with reference to the understanding level objectives.

19. There is no significant difference between above average student-teachers of the control and the experimental group in their post-test mean scores with reference to the application level objectives.

20. There is no significant difference between the pre-attitude and post-attitude scores of the control group student-teachers.

21. There is no significant difference between the pre-attitude and post-attitude scores of the experimental group student-teachers.

22. There is no significant correlation between the gain scores and the pre-attitude scores of the control group student-teachers towards E-content in the Teaching of Mathematics Education.

23. There is no significant correlation between the gain scores and the pre-attitude scores of the experimental group student-teachers towards E-content in the Teaching of Mathematics Education.

24. There is no significant correlation between the gain scores and the post-attitude scores of the control group student-teachers towards E-content in the Teaching of Mathematics Education.
25. There is no significant correlation between the gain scores and the post-attitude scores of the experimental group student-teachers towards E-content in the Teaching of Mathematics Education.

26. There is no significant effect size for the difference between the means of pre-test and post-test score mean in E-content in the Teaching of Mathematics Education.

27. The gain ratio obtained through E-content in the Teaching of Mathematics Education among the B.Ed. student-teachers is not high.

**1.15 DELIMITATIONS OF THE STUDY**

The following are the delimitation of the study

1. The investigator has chosen only two colleges of education in Karaikudi for conducting the present study.

2. This study was conducted based on the Alagappa University B.Ed., syllabus only the year 2013-14.

3. This study is confined to only one unit of Teaching of Mathematics Education syllabus of B.Ed., prescribed by the Alagappa University, Karaikudi.

4. The experimental treatment was given for a duration of two months only.

5. Only English Medium students were taken to see the effectiveness of the e-content in teaching of Mathematics Education.