**DEVELOPMENTOF E-CONTENT IN MATHEMATICS**

**BASED ON THE TOPIC CONIC SECTIONS FOR**

**PLUS ONE STUDENTS**

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**DECLARATION**

 I, SAJILA.V.S., do here by declare that this dissertation DEVELOPMENTOF E-CONTENT IN MATHEMATICS BASED ON THE TOPIC CONIC SECTIONS FOR PLUS ONE STUDENTS has not been submitted by me for the award of any Degree, Diploma, Title or Recognition before.

Farook Training College SAJILA.V.S

 30-10-2013

CERTIFICATE

 I, Mr. T. Umer Farooque, do hereby certify that this dissertation entitled DEVELOPMENTOF E-CONTENT IN MATHEMATICS BASED ON THE TOPIC CONIC SECTIONS FOR PLUS ONE STUDENTS is a record of bonafide study and research carried out by SAJILA.V.S., under my supervision and guidance .The report has not been submitted by her for the award of a Degree, Diploma, Title or Recognition before.

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 Chapter I

INTRODUCTION

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INTRODUCTION

 The world in which we live is changing rapidly. Modern time is the era of technological advancement. Hence it is essential to apply in the educational field also. Technology in education can be conceived as a science of technique and methods by which educational goals can be realized.

 Educational systems around the world are under increasing pressure to use innovative methodology and integrate new information and communication technologies (ICTs) in the teaching learning process to teach in the 21st century. With emerging new technologies the teaching profession is evolving from an emphasis on teacher centered: lecture based instructions to student centered: interactive learning environments. The process of teaching then in the frame of reference involves arranging for the inputs and designing of the situation or process through which a student learns to perform in a desired or specific manner.

 In today’s education the computer has become the new pencil and paper, textbook, library and in many cases the teacher. The computer and its related technologies are now such an integral part of everyday life that it must be an ingredient in educating for participation in present and future society.

21st Century is characterized with the emergence of knowledge based society where ICT plays a pivotal role. Government of India has announced 2010-2020 as the decade of innovation. Reasoning and critical thinking skills are necessary for innovation. Foundation of these skills lay at school level. Information and Communication technology has permeated in every walk of life affecting the technology field such as launching satellites, managing business across the globe and also enabling social networking. It is desirable that affordable ICT tools and techniques should be integrated into classroom instructions right from primary stage so as to enable students develop their requisite skills. Most of the tools, techniques and tutorials are available in open domain and accessible on web. The National Curriculum Framework 2005 has also highlighted the importance of ICT in school education. By enabling ICT, major shift is imperative in education characterized by imparting instructions, collaborative learning, and multidisciplinary problem solving and promoting critical thinking skills.

In the new phase of the knowledge revolution the source of knowledge has shifted from one source to different sources. In other words we can say that there is a decentralization of the knowledge source. The presence of computers in schools has increased dramatically and predictions are that this trend will continue to accelerate technology usage in classrooms, motivates students and teachers, increases productivity and facilitates instruction. When used with effective instructional practice, technology facilitates learning and students learn the content in depth. Technology is an increasingly influential factor in education. Computers are being widely used in developed countries to both compliment established education practices and develop new ways of learning such as online education. This gives students discretion in what they are interested in learning.

 Teaching is no longer ‘chalk and talk’ , it is supported with various media like books, journals, audio visual aids, electronic media i.e., radio, television, computer etc. Now educators use technology to create a rich environment where student work shows evidence of conceptual understanding beyond recall. Technology is used to provide opportunities for students to apply knowledge in real world contexts and engage in active participation, exploration and research.

 One of the latest technological developments is the E-learning which focuses on self learning through electronic devices. We do know the ‘e’ stands for electronic. The ‘e’ in e-learning would be better defined as Evolving or Everywhere or Enhanced or Extended. Involvement in e-learning is not going to mean that teachers will spend hours sitting in front of computer screens any more than there is an expectation that their students will be doing that.

 E-learning is not going to replace libraries, friends, colleagues, and many of the existing social networks that contribute to a satisfying learning and teaching experience. In fact many of these will be enhanced by the ability of the teacher to access them in different ways. This is not a type of learning environment but one where the internet can be used for the things that cannot be achieved in any other way. The flexibility, availability and adaptability of the internet environment must serve the needs of both e-teachers and e-learners.

 Thus education is becoming more and more international, considering this global scenario, the role of a teacher has been considered as a designer with well equipped latest technological weapons of education. Thus a modern teacher is one who capable of adopting suitable technological strategies at every stages of learning activities so that the learner may be empowered to perform his best. Hence for the learner when the education is life itself, it is a preparation for the teacher.

**NEED AND SIGNIFICANCE OF THE STUDY**

 Education is the preparation for the future and a nation’s future prosperity depends on the quality of present generation those who will become tomorrow’s work force. The transition of the world into the global village poses a big challenge for the teachers of today, to impart such quality of education which will help the students in moving with confidence and remain abreast with the latest and innovative in the outside world.

The more we rethink and restructure the teaching-learning strategies, the more the learners need becomes. Today’s students no longer want to be passive recipient in the information transfer model of learning. Rather they want to be active participants in the learning process. There is growing recognition that today’s world requires that students be able to work collaborately and creatively and reflect on their own learning process.

 At present there is an urgent need for modernization and adoption of new technologies in education to meet the trim challenges of quantity and quality. One such innovative that can suit to the present scenario is E-learning.

In the modern educational area the pupils occupy the central place. The whole educational process is centred around the need, interest, capabilities and requirements of pupils. The National Policy of Education (NPE 1986) also favours child centred approach to increase pupil participation in the teaching –learning process. Philosophers and educators today give emphasis to different pupil dominant strategies like discussion method, project method, problem solving method, programmed instruction, Self learning modules and latest e-learning strategy. These strategies enable the younger generations to attain maximum efficiency in different academic subject and hence the adoption of these different pupil dominant strategies helps to provide the overall achievement and quality of pupils.

Investigator being a teacher of Mathematics has to do a lot to instill interest in the subject. The informal surveys on students and teachers of secondary and higher secondary schools, the investigator lead to the fact that among the various subjects mathematics figures as the most troublesome for majority of students. Many students perform poorly in mathematics and find the subject very difficult to learn and apply in relevant situations.

Mathematics is a quantitative subject that fosters the development of cognitive abilities such as thinking and reasoning. These are important for not only in mathematics but also in other school subjects. Mathematics is a basis for all scientific and technological studies. Additionally it has high relevance and practical applications to many real life situations. National curriculum Framework (NCF2000)recommends that the study of Mathematics contributes in the development of precision, rational and analytical thinking, reasoning, a positive attitude and aesthetic sense among students. This subject is the key to opportunity no longer just a language of science and now contributes in direct and fundamental ways to business, finance, health and defence. For students it opens the doors to careers. For citizens, it enables informed decisions. For nations, it provides knowledge to compete in a technological economy.

Mathematics has an important place in all levels, from primary to higher secondary. But the student’s performance and interest in this area is not much satisfactory. This is because either the abstract nature of the subject or the inadequacy of the teaching-learning process.

 The reasons suggested by SCERT curriculum committee for such a difficulty are

* The abstract nature and formal structure of mathematics
* Teaching the subject without linking to real life.
* Curriculum beyond the capabilities of the child.
* Teaching without emphasizing the concept.
* Lack of natural order in the development of topics.
* Teaching without due stress on logic.
* Undue importance to solutions instead of the process of the solution.
* Not acquiring learning experiences with the help of learning aids.

 A further analysis of the situation revealed that, the other reasons for this poor performance may be by the negative attitude towards the subject, Lack of interest in the subject, Anxiety andLack of previous knowledge for learning mathematics at each standard.

 Mathematics is such a subject that can evoke boredom among students. So the adoption of a different methodology in its teaching can vastly improve the result. Numbers, letters, shapes etc when made part of a visual real life experience with the help of multimedia will definitely have a bigger input on the students. It can influence the entire thought process of the students in the subject. They may now feel that mathematics is not just usage of some ‘**+**’, ‘**-**’or ‘x’. The students may perform much better when these concepts are clear in their mind with the help of the ‘e’ content delivered. They may approach the topic with a clear feel of confidence as the panic feeling or a stereotypic mental frameset about the topic is removed from their minds.

**STATEMENT OF THE PROBLEM**

 The study is entitled as ‘DEVELOPMENTOF E-CONTENT IN MATHEMATICS BASED ON THE TOPIC CONIC SECTIONS FOR PLUS ONE STUDENTS’

**DEFINITION OF KEY TERMS**

The operational definition of the terms are given below

DEVELOPMENT

 For the present study, development means the preparation and validation of e-content. It includes planning, designing and implementation of the e-content.

E-CONTENT

 Refers to that form of knowledge or content which is packed in an electronic form. It includes text, audio, video, animations, images etc. simply e-content is defined as the digital text and images designed for display on web pages. The e-content developed for the present study is based on the topic conic sections of eleventh standard.

CONIC SECTIONS

Conic sections are the curves obtained by intersecting a cone by a plane. It is a topic in 11th standard mathematics.

**Variables Selected for the Study**

 The independent, dependent and control variables selected for the present study are the following:

**Independent Variable:**

The independent variable selected for the study was two teaching methods- teaching through the developed e-content and constructivist method of teaching.

**Dependent Variable**

Achievement in mathematics of plus one students was treated as the dependent variable.

**Control Variable**

The variable controlled for the present study was the initial status of the students in terms of achievement in mathematics as measured by a pretest.

**OBJECTIVES OF THE STUDY**

**Major objectives**

1. To prepare an e-content in mathematics based on the topic conic sections for plus one students.
2. To validate the e-content in mathematics based on the topic conic sections for plus one students.

**Minor objectives**

1. To compare the mean pre-test scores between experimental and control group.
2. To compare the mean post-test scores between experimental and control group.
3. To compare the gain scores of experimental and control group.
4. To compare the mean pre-test post-test scores of experimental group.
5. To compare the mean pretest-posttest scores of control group.

**METHODOLOGY**

 The pretest-posttest non-equivalent-group design was used for the study. The development of e-content involves three steps.

The steps followed are

• Planning of the content

• Designing of e content and

• Implementation of e-content

**Planning of the Content**

 The investigator analyzed the present mathematics text books and hand books for 11th standard and locate the area conic sections in which most of the students feel tough in understanding the concept.

**Designing of the content**

 The steps followed are

* Write a script
* Correct it
* Collect all visuals and pictures needed
* Prepare a story board
* Prepare for the narration
* Video shooting
* Edit the video
* Authoring

**Implementation of the e-content**

The prepared e-content was implemented by administering it in two classes of 11th standard and comparing the entry behaviour and terminal behaviour of the students.

**Sample**

 The participants in the process of validation of the prepared e-content were plus one students belonging to Kozhikode District of Kerala State. The softwarewas validated on a sample of 76 plus one students from two schools.

**Tool used**

 The investigator developed an e-content on the topic conic sections for plus one students. The investigator also developed an achievement test under the supervision of the guide on the basis of the topic conic sections.

**Statistical techniques used**

The data collected was analyzed using test of significance of mean difference for large independent samples.

**SCOPE OF THE STUDY**

 The study focuses on preparation of an e-content on the topic conic sections of Mathematics for plus one standard students. The developed e-content will surely help the 11th standard students who are not having clear idea on the abstract topic conic sections. The e-content prepared, includes contents which are more useful for the study of mathematics at higher education. This will act as a teacher substitute. Different aspects of the learner such as observation, previous knowledge, proper explanation with the help of animation and graphics, adequate examples were taken into consideration while constructing the e-content.

 The e-content will be helpful for higher secondary school teachers for enabling their students to learn mathematics at higher secondary level through self-learning. It will help the parents to motivate their children in learning mathematics.

**LIMITATIONS OF THE STUDY**

 E-content was prepared based on the Mathematics topic ‘conic sections ‘at higher secondary level. The e-content is prepared based on the assumption that the learners have basic ideas in related areas.

 Even though at most care was taken for the conduct of the study, some limitations are intruded. Some of the limitations are

 • The content selected is only a small topic in 11th standard.

 • The tests used as pre-test and post-test are teacher made tests, not standardized ones.

**ORGANIZATION OF THE REPORT**

Chapter I present a brief introduction to the problem, need and significance of the study, statement of the problem, and definition of key terms, variables selected for the study, objectives, methodology, and scope and limitations of the study.

 An orientation to the characteristics of a new instructional strategy known as E-learning and E-content development together with review of reported studies in the related area is in the second chapter.

 In Chapter III, the methodology of the study is described with the procedure of construction of the e-content, the sample, tools used and the statistical techniques.

 The validation procedure of the e-content is given in detailed in the fourth chapter 'Analysis'.

 Chapter V represents the summary of the study, Major findings, educational implications and some suggestions for further research in this area.

**Chapter II**

**REVIEW OF RELATED LITERATURE**

**Theoretical Overview**

**Review of Related Studies**

**REVIEW OF RELATED LITERATURE**

 Review of related literature allows the researcher to acquaint himself with the current knowledge in the field or area in which he is going to conduct the research. By reviewing the related literature the researcher can select a fruitful not much explored research area. Review helps the researcher to know about the methodology, the tools and instruments for the study. Thus review of related literature is one of the most important steps in a research.

 This chapter deals with review of related literature categorized in to two sections viz., Theoretical overview of E-learning and ‘Review of Related studies’.

 In the section ‘Theoretical overview’ an attempt was made to explain the characteristics of e-learning, e-content development etc. characteristics of a self-instructional module and the principles of constructing a SIM.

 In the section ‘Review of related studies’, a review of available studies in the area of instructional strategies is given.

**THEORETICAL OVERVIEW**

**Emerging Scenario**

 E learning and its concept in the context of education and modern learning has assumed great relevance for 21st century pedagogy. The two international commissions and various national level committees in India in the past 30 years or so have stressed on a paradigm shift in the area of education, teaching and instruction. As a result, learning stands recognised as a lifelong process, supported by a system called multi-channelling. The fundamental basis in the contemporary concept of organization has been the belief that learning and growing do together. It lays emphasis on the importance of continuity of learning. The theories of learning and their corollaries in terms of instructional designs which dominate even today.

 **Theories of learning and instructional designs**

Three theories of learning have specially influenced the system of instructional designs in the past 150 years. These are behavioural, cognitive and constructivist approaches to learning.

**Behavioural learning**

The theory of behaviourism can be traced back to Aristotle. Its main focus is on overt behaviours of students that are measurable and observable. It seeks to establish the mind as a ‘black box’ that makes it possible to observe stimulus and response qualitatively. It ignores the possibility of the human thought process coming in the way. The theory has travelled through various phases of value addition. Some of the key thinkers in his category have been Watson, Pavlov and Skinner.

 Some examples of major instructional designs developed under the influence of Behaviourism are:

The Behavioural Objectives Movement: This movement lays emphasis on ABCD, that is:

 A - Audience;

 B - Behaviour;

 C - Condition; and

 D - Degree.

**Bloom’s Taxonomy of Educational Objectives:** It is widely used by instructional designers to keep track of how learning transverse from level 1 (knowledge) to level2 (comprehension) to level 3 (application) to level 4 (analysis) to level 5(synthesis) and to level 6 (evaluation).

**Gagne’s Model of Instructional Events:** It focuses on gaining attention, information the learner about objectives, recalling pre-requisites, presenting stimulus, providing learning guidance, eliciting performance, providing feedback assessing performance and enhancing relation and transfer.

**Robert Major’s Learning Objectives:** As the development of thoughts and systems on structuring and designing instruction became a key area for research, writing behavioural objectives in terms of specific and terminal behaviours that could be observed and measured attained significance.Directionless instruction stands criticized on the ground that it may not lead to the desired objectives of learning.

**TeachingMachines**: The movement of teaching machines also came to the scene during this revolution of learning. This is a direct consequence of technological development, especially in the field of computers and telecommunication. B.F. Skinner is known as the strongest and most effective proponent of teaching machines. It may, however, be noted that contribution of teaching machines was mostly limited to automated tests of programmed instruction.

**Computer Assisted Learning:** Evolved during the behaviourism movement, it was first used during the 1950s. IBM and people like Gordon Park and O.M. Moore were its early champions.

**Systems Approach or Instructional Systems design (ISD):** The systems approach developed as a result of various researches undertaken during the 1950s and 1960s, particularly due to the changing economic scenario.Beinga post-World War 2 phenomena and after the customised and programmed training was realised, the industry went through a metamorphosis.

**ADDIE:** Analysis, Design, Development, Implementation and Evaluation are a scientific approach to creating instructional material and activities. It is different from the traditional teacher centric approach to education. It is a process of Systems Approach to Instructional Design. World War 2 and the subsequent industrial growth gave way to this model of infrastructural design, which attained a centre stage. This model focuses on learning with clear-cut outcomes.

**Instructional Systems Design (ISD) and corporate Training Connect:** The process of instructional systems approach starts with the emergence of trends in performance gap. These parameters are tangible when it is perceived that the organization, by way of performance, is not moving in the direction that was the focus of the business.

The whole process of design and development of instruction begins and ends with a specific business problem and a clear-cut focus in terms of organizational growth. ADDIE is the basis for the definition and delivery of training in the corporate training. It entails e-learning as well.

**E-Learning**

EllitottMasie, one of the renowned experts in e-leaning, suggests that e-learning is the use of network technology to design, deliver, select, administer and extend learning. In a more elaborate standpoint, Cisco Chairman John Chamber states that e-learning is an internet-enabled learning process whose components can include content delivery in multiple formats, management of the learning experience and community of networked learners, content developers and experts.

It is a type of learning which takes place as a result of experiences and interaction in an environment. It is not restricted to a regular school day and can take place in a variety of location including home, school and community location. Example: library, cafe etcThe delivery of learning, training and educational programs by electronic means is E-learning. E-learning involves the uses of computer or electronic device such as mobile phone, in some way to provide training, educational or learning material.

E-learning can involve a great variety of equipments than online training or education, for as the name implies, online, involve using the internet or an E-learning can involve a great variety of equipment than on line training or intranet, CD-ROM and DVD can be used to provide learning material.Distance education provided the base of e-learning development. E learning can overcome the limitations viz, timing, attendance and travelling difficulties.

After peeling through various definitions, one can envision e-learning as a universe comprising three basic elements: that is, content, services and technology. As in the case of conventional learning, content forms the backbone of e learning; technology forms the rider on which the content flows, and the services is the support system that lends human touch to the process of learning via the internet.

**State of E Learning**

E-learning permits the delivery of knowledge and information or learns at an accelerated pace, opening new vistas of knowledge transfer. Early adopters are companies that have tried to supplement face to face meeting demonstration, training classes and lectures with this technology. The adoption of e learning in all spheres-corporate, school, universities, etc. is low at present. The Indian market is not substantial when compared to international market.

E-learning in India has been most successful in corporate segment where it is seen as a means of achieving business goals and motivating employers. Although e learning has potential in India, adoption has been slow and will need a major marketing and awareness efforts.

**Changing Role of Teachers and the Classroom Environment with the Advent of E Learning**

Many words have been written about the internet and the possibilities for its use in e education but little has been researched about how teachers effectively modify their practice to work in the new environment. It is just because, teachers in schools have teacher education qualification, which did not prepare them to be e- teachers. Being able to teach confidently in one environment is not a precursor to success as an e teacher in very different environment. The e-teacher, who is surrounded by rapidly changing e-environment and technology, must at times feel like they are trying to change type on a moving vehicle. When exploring the challenge and changing role of e teachers it is a little like encouraging them to be information and environment architect. The environment they create may well be totally being aligned with the work of regular classroom so that e learning becomes an integral part of it. Alternatively it may be virtual classroom where the students only visit electronically.

**E-Learning and its Impacts on Teachers**

 The network environment of this new internet, connected world has expanded the opportunities for teaching and learning in ways that we are only beginning to understand what makes the implementation of e-teaching so challenging that we are asking teachers of the dot.com as to teach in way in which they have never be taught when they were at school. They will work in an environment in which they have never be learners and may have few first hand experiences.

**Some key Advantage of E-Learning with respect to ADDIE**

ADDIE, the cornerstone of all media-based education, is very well suited for the creation and maintenance of e-learning. Its main focus is to keep the learning compact and to the point, that is, specific to the needs of the learner. E learning does just that. In e-learning, each individual unit of instruction is independent and the learning is created and maintained on a modular basis. In other forms of education and training, instruction is not justified as in case of e-learning. In the classroom based environment, the interactions may take the training to an altogether different plane, without any active intervention by the teacher. The good thing about e-learning is that it is consistent for different sets of people.

**Cognitivism and Learning**

 Cognitive theorists recognize that learning involves associations established through contiguity and repetition. They acknowledge the importance of reinforcement and stress its role in providing feedback about correctness of responses over its role as motivator. However , even while accepting such behaviourist concepts, cognitive theorists view learning as involving the acquisition or reorganization of the cognitive structures through which humans process and store information.

Some of the main points of cognitive theory of education are

• The behavioral objectives theory, which culminated into ADDIE, could not describe the social behaviour of human beings with respect to learning and their reaction to various stimuli. The basis of cognitive theory of education is that human beings have an internal knowledge structure that cannot always function the way the instruction is programmed to function. This theory of cognitivism criticizes objectivism saying that it denies the basic fact that the learner has some knowledge of things from one’s own experience-previous and current. The proponent of this theory emphasis that it becomes easier for the learners to learn if they can establish any meaningful links between meaningless information and experience or knowledge.

• The theory of cognitivism also postulates that it is always better for students to learn serially, from start to finish. The learner would have a lot of problem with items occurring in the middle of the list unless it is markedly different.

• Distributed practice leads to greater retention because the learner can associate the material with a wide range of contexts than one context frozen by the system for mass use.

• Prior knowledge has a direct impact on learning the new learning tasks. It could lead to facilitation as well as interference in learning the new tasks.

• The learning is more lasting when the learner categorizes and organizes inputs by self.

• The level of sensory processing determines the level of understanding.

• If learning happens in a certain situation, the implementation would also require similar settings.

• Learner uses mnemonic strategies to make more sense out of meaning with less input. Refer to the example of ABCD to explain and remember Audience, Behaviour, condition and degree in an objective.

**Constructivism Vs E-Learning**

The constructivist approach to education is not a new concept. It has now taken the educationalists by storm and has gained tremendous attention with e-learning taking up the baton of education and training form the traditional method. This is the in-thing today. Educationalists and instructional technologists are working overtime to define various aspects of the theory and its application. Simply, put constructivism means letting the learner create one’s own learning. Computers and the internet provide immense possibilities for the learners to explore learning on their own.

**Comparison of Conventional Learning and E-Learning**

|  |  |
| --- | --- |
| **Conventional Learning** | **E-learning** |
| Students attend a school in their local community or attend a boarding or a correspondence school.  | Students participate from variety of location and may attend multiple learning institution or their local schools. |
| Classes are scheduled according to school hours and timetables. | Students may determine the school times when they access e-learning opportunities |
| Students are directed to work individually or in groups  | . Students can choose to work individually or collaboratively with people who may or may not be in regular classes. |
| Classes are synchronous and teachers and students interact in real time. | Classes may be synchronous or asynchronous  |
| Students are generally enrolled with one school.  | Students may take classes form more than one school |
| Learning objectives are set by the teachers and institutions. | Students may set their own objectives and explore their own learning needs and agendas. |
| Teachers work in one school | E-teachers can work more than one school. |

**Spectrum of E-Learning**

 E-learning offers great opportunity to try out a spectrum of instructional strategies. The most important and useful instructional strategies are the ones that lead to increased learner attention and involvement. An e-learning involves a great deal of learner interaction by way of interesting developmental questions and real life simulation. In most e-learning products, the learner actually does things instead of seeing things done or seeing just an expression of what happened. For example, as part of learning to work with Microsoft word, the learner actually opens MS-Word, creates a document and save it as is done in the actual environment.

E-learning has actually opened a wide range of strategies to pick from. It has facilitated the amalgamation of technologies. E-learning not only limits itself to electronic aids but can also bring in the teacher to the virtual classroom. The learning technologists focus a great deal on working on a hybrid model of learning, which collectively combines all other models and creates learning that is robust from all points of view.

Focus on the two main instructional strategies, that is John Keller’s ARCS (Attention, Relevance, Confidence and Satisfaction) model and Gagne-Briggs’ model of instruction and how they apply to e learning. Keller postulated that the factor of motivation is the most critical criterion in designing and delivering instruction effectively. While Gagne Briggs argue for a university pedagogy based on a constructivist view of learning, students learn best when they construct their own meaning and demonstrate their knowledge and skills by applying them in the solution of new or unusual problems. If proposed learning outcomes, teaching methods and assessment are aligned, there is every chance that learning will be enhanced.

In today’s university, a wider range of student’s talent (or lack of it) demands a pedagogy that is more focused, transparent and facilitative. It is very important to understand that though the systems approach to instructional design is the most widely used approach by educators in the traditional method as well as by the designers of e-learning, one should not stop looking at other methods. Actually, all the three main theories can be applied to instructional design. Try and combine behaviourism, cognitivism and create instructions that best help the learners. This mixing of theories and strategies is even more relevant in the e-learning environment. There are e-learning products that have successfully tried to create instruction using all the theories in various situations. Other than technology that anyway plays a critical role in shaping any idea, the course of e-learning will be impacted by the need of education and learning. While institutions such as universities and schools would primarily apply e-learning to supplement in-class education, the primary drive for investment in the e-learning environment will come from the corporate sector.Increasingly, as e-learning becomes an important element within a larger domain of knowledge mobilization and management e-learning in-itself will tend to move closer to business. This movement will be manifest in the close correlation between learning outcomes and business outcomes

**Trends in E-learning**

According to Michaiel F Christie and FaribaFerdos, educational technology, as a subset of pedagogy, provides sound use of any technology to support and improve learning. Information technology, on the other hand, focuses more on the digital delivery of information. Technical issues tend to take precedence. However, educational and information technologies cannot be separated. For better or for worse, they impact upon one another. When one seeks to improve learning using digital media, pedagogical considerations are always an issue; thus, there is need for a conscious pedagogy of e-learning. The same fundamental questions that are asked of traditional university pedagogy need to be asked of e-learning but in addition, the potential for a radically different, more innovative pedagogy has to be explored. E learning is made possible by a revolution in information communication technology with changes occurring as a result of the revolution that continues at an exponential rate. The most obvious change as far as tertiary education is concerned involves the expansion of off-campus courses. E learning is here to stay, both as a support for face-to-face teachingand as the main means of distance education. Good pedagogy can inform and by supported by good ICT. Poor pedagogy can subvert the very point of using good ICT. A combination of bad pedagogy and bad ICT is a disaster for the future of e-learning.

**Advantages of E-Learning**

‘Nothing can replace classroom traditional teaching, but e-learning complements the process and can help reach out the masses’ GoutamGoradia, Managing director of remit tag Software Company. The biggest advantage of e-learning lies in teacher’s ability to cover distances for an organization that is spread across multiple locations. Traditional training becomes a constraint as all the trainees need to come to classroom to get trained. The major advantage is consistency that e-learning provides, e-learning is self-paced, and learning is done at the learners pace. The content can be re-repeated until it is understood by the trainees. It can be made compelling and interesting with multimedia, and the trainee can be given multiple learning paths depending on his or her needs. The main advantages are given below:

1. Electronic learning

 It changes the way of imparting and receiving education and eliminates barriers of time and distance. The information through internet is easily available. It is very accountable and reliable. Today more than 70 million students are educated through internet.

2. It helps

E-learning helps in increasing knowledge of the content, delivery of knowledge in multiple formats, managements of learning experiences and network community of learner’s and experts.

3. E-Learning provides for

E-learning provides faster learning.Research study finds that learning occurs 50% faster online than classroom. Through e-learning cost of education is 40 to 60% lower. Any combination of subjects of learner’s choice is possible here. It eliminates needless repetition of programs and subjects content and organizational learning gaps. Contents can be captured by using slides, audio, video and CD’s.

4. The systems of e-learning also can be worked out for

Workshops, seminars, testing the capacity of learner, interaction with the teachers and group discussion.

**Future of E learning**

 We can assume, that for the immediate future, university e-learning will continue to be based on previously discovered knowledge, that it will rely heavily on text, that it will continue to be divided into academic disciplines, that it will suit some subjects more than the others and that e-learning students will be assessed and graded. Given the speed with which ICT is developing, not all of these assumptions will hold for very long. Already, as Einstein predicted some years ago, the most important research is occurring at the intersection of traditional disciplines. E-learning could open the door for more cross-disciplinary, even completely new subjects. The reliance on conventional text could also be a short-lived hangover. ICT offers the possibility for active, interactive, parallel and hypertext links and layers; text interspersed with movies, animation, sound bites or streamed lectures. The possibilities are so enormous that it is worth considering some fundamental pedagogical questions, which can serve as a checklist for creating a new e-learning pedagogy. We have to ask four key questions:

 What is the purpose of this course or teaching and learning sequence?

 How can we best achieve that purpose?

 How can we know that we have achieved that purpose?

 How can we go on improving current practice?

If the purpose is to make learning more flexible so that students, whether on-or-off-campus, can access course material when they need or want to, then it makes sense to put course or subjects online. In an accredited credentialing system, success can be measured best by good grades in a sound assessment schedule. Improving practice can occur by fine-tuning what Biggs calls the constructive alignment of courses or subjects. Traditional university pedagogy contained an implicit assumption that the student has to sink or swim. Lack of academic support at university marked the passage from secondary to tertiary education. University students were given the right to miss lectures, neglect assignments and flunk. In e-learning there is a similar emphasis on students’ responsibility but as online students have noted, they often get more immediate help from their teachers via e-mail than their counterparts do on-campus.

**Pedagogical challenge of e-learning**

What differentiates e-learning from traditional on-campus learning is that it is embedded in an ICT environment. There is a mutual impact between pedagogy and ICT. Most of this argument suggests for the need to apply sound pedagogy principles to online teaching. The media itself suggests and enables new and creative pedagogical approaches. ICT allows for text mixing, for example, there is a software that will read 2,50,000 pages an hour, ‘scanning reams of documents, categorizing information and making links and visual maps, according to Jackson. This capability suggests new ways of teaching. At the very least, it offers an opportunity for experiential learning that was not possible in traditional higher education pedagogy. ICT is a tool for human thought and creativity, including pedagogical creativity. One creative pathway is to analyze what works best in the traditional on-campus education and utilize that as a model for online innovations. A good university education is characterized by varied educational and social experiences. Students receive information via lectures as well as interact with a mentor and their peers in tutorials. They practise what they had learned in laboratories or through assignments and receive feedback via assessment. The last experience is often the least effective, especially, if the assessment is summative rather than formative. The potential impact of ICT on on-line education is that students can have an even more varied experience. Because the learning takes place on the World Wide Web, students could access much more information, have more individual contact with teachers, tutors and peers, practice in more diverse ways and be assessed more creatively . An exception, of course, is the hands–on practice that many natural science students get on campus. The pedagogical challenge will be to streamline this potential flood of information and make it accessible and knowledge. We can point out, information is not necessarily knowledge and knowledge is not always wisdom.

**Dangers and opportunities**

The potential opportunity or danger is that e-learning enables ‘ tele-presence’. It can literally displace the on-campus university. Such a paradigm shift in the organization of educational provision may suit government and big business. Both government and industry hope to save large amount of money on infrastructure costs by making education and training available on-line. There is also much talk in political circles about equity issues and lifelong learning because government realizes that in a rapidly changing economy, workers must be able to constantly retain if they are to stay employable. Government, industry and some universities see e-learning as a means of this. Such optimism is contagious but it begs a number of questions. Will such an equation delivery be cheaper? Will it it be more accessible? Can it or should it replace the traditional face-to-face university education?

 If the pedagogical quality of new ICT based courses is substandard, they may prove to be a false economy. A poorly trained or re-trained person could cost a company more money than what it saves on running an in-house course. In answer to the second question, it does seem that ICT has improved access for learners in the privileged western world. Whether it promotes accessibility on a global scale is another matter. Developing countries are playing a hopeless game of technological catch-up and an increasingly sophisticated ICT based teaching and learning material may, in fact, reduce rather than extend educational accessibility. In answer to the third question, it seems highly likely that education will be packaged and sold like other products on the global market. Degrees are saleable products, as we already know from the increasing number of universities who charge students high fees. As the number of online courses increases the quality of product will be judged by the consumer and the old adage, ‘buyers beware’ will apply. World famous universities have a head-start in such a competitive world but there is no reason why large or small companies, with an eye on profit, could not carve out niche markets for themselves.

**Developing pedagogy of E Learning**

The question of content creation looms large in the backdrop of EDUSAT and exclusive educational television channels like Vyas, Gyandarshan, Ekalyva which are badly in need of content to telecast. Responding to the need, the UGC – Consortium of Educational Communication has taken up a mission of training the Higher Education teachers in the art and science of e-content creation. But, for a country like India with one of the largest higher education systems in the world, a single agency cannot serve the immediate purpose. The need of the hour is a policy decision to train the teacher educators and personnel of other teacher development agencies in the country as trainers in e-content development, who in turn would carry the message and continue the mission of providing e-content development training to scores of teachers across the nation. Of course the question of creating the necessary infrastructure comes up. The solution is to exploit the potentials of EMMRCs and to create departmental level studios, like the one at the Department of Educational Technology, Bharathidasan University. The cost involved will only prove to be an investment and not expenditure.

For developing pedagogy for e-learning, it is important that we ask four fundamental questions about the purpose, method, assessment and evaluation. An essential feature of any pedagogy for e-learning must be that it is forged by teachers together. Teachers and learners share responsibility for continuous improvement of that learning.

**Importance of E-Learning**

 The importance of e-learning cannot be ignored as across the world, students have saved time, money and managed to get easy accessibility of the knowledge, irrespective of their place. Students need not to spend on travelling, accommodation, food and high fees for tutors.

With easy access, e-learning programmes have become more complex. New trends like the expansions of application are developed by constant training. Blended e-learning is also become the latest trend. To facilitate such programmes some companies are providing e- learning solutions. They have developed custom-made integrated e-learning content solutions in many languages and multi interactive forms of learning solutions.

**Conclusion**

A foresaid discussion clears that e-learning is an advanced concept. It focuses on self-learning through electronic devices. It provides support and atmosphere for self-learning achieving maximum knowledge. Its importance cannot be ignored. It saves time, money and students manage to get easy accessibility of e-learning solutions irrespective of their place. It changes the way of imparting and receiving education. So now it is the time we should accept e-learning and provide such facilities to our young ones.

**REVIEW OF RELATED STUDIES**

Some of the reviewed studies related to the present area are abstracted below.

 Das (1998) conducted a study on the effectiveness of computer assisted learning material on rhymes in different modes. He found that composite modes of presentation of computer assisted learning material (CALM)may not ensure higher cognitive language learning.

Khirwadkar (1999) developed computer software for learning chemistry at standard 9. The developed software package was found to be effective in terms of academic achievement of the students. The students and teachers were found to have favourable opinion towards the software package. There was found an interaction effect of IQ , motivation , opinion of students on their academic achievement.

NatesanandKandasamy (2001)studied the effectiveness of teaching concepts in mathematics through video cassette. The study found that learning mathematics concepts through video films increase the rate of learning.

Juseena (2002) conducted a study on the topic preparation and testing of teacher assisted learning module on simple equations for standard 8. They found that the modular approach when compared to the formal approach is more effective in stimulating cognitive aspects in students like acquisition of knowledge ,relation of concepts , discovering the true spirit of mathematics and providing for self correction.

Ruttanathummatee (2004) studied the effectiveness of computer assisted instruction for primary school students. The CAI packages developed by the investigator on Thai language have been found effective.

 Singh and Reed (2004) reported an article named achieving success with blended learning. They argued that blended learning focuses on optimizing achievement of learning objectives by applying the right learning technologies to match the right personal learning conclude as organizations are rapidly discovering that blended learning not only more time and cost effective, but provide a more natural way to learned work.

Joy and Shaiju (2005) developed computer assisted learning material in history at higher secondary level and its effectiveness. The sample included 162 eleventh standard students and found that the CAI is an effective method of teaching at higher secondary level.

Rathod (2005) conducted a study named development and implementation of an information technology based instrumental package for English grammar to Gujarathi medium students of standard 8 of Jamanagar city. The developed IT based package was found to be effective for teaching English grammar because there was found a significant difference in the gain mean scores of the experimental group and control group. The students were found having positive reaction towards the developed IT based instructional package.

Jessy (2006) conducted a study on effectiveness of Teacher Assisted Modules in Biology on achievement of students at secondary level. They found that the Teacher Assisted Modular approach is more effective than the text book oriented lecture method on biology achievement of the secondary school students.

Panchal (2006) conducted a study named development and tryout of self learning materials in English subject on the unit of Active and Passive Voicefor the students of standard 12. The students have been found to have favourable opinion on the self learning material.

Jayaraman (2006) studied the relative effectiveness of Computer Based Multimedia Learning Packages on performance and behavioural outcomes of students of different age groups. The CBMMLP prepared specifically for the particular concepts are significantly effective for all age groups of students. There has been found a higher usage by higher age group students.

Malathi(2007)reported an article named E-Learning in higher education: Issues, benefits, future. This article attempts to present the recent trends in pedagogy , that the management of higher education have began to adapt. The article will look into higher education institutions with emphasis on indian institutions especially at the under graduate and post graduate levels adopting the use of e learning in their instititions.

Rathore (2007) reported an article named Effective Teaching through E Learning . The author said that the challenge for educational organisations that aspire to provide e learning in India is to get a good program that meets the learner’s need and then makes the cultural change in the way they learn.

Mary (2007) reported an article named Learning strategies and Mathematics stating that learning strategies should be a part of every lesson. The author avers that teachers should model the problem solving strategies and monitor their use by the students to enable them to generalize these strategies into other areas and become independent.

GnanadevanandNimavathi (2008) conducted a study on the effectiveness of multimedia program in teaching sciences. The study was concluded to develop a multimedia program for the teaching of sciences and experimenting the same with a set of children studying in the ninth standard and finding out its effectiveness over the conventional method of teaching. The results show that the multimedia program prepared by researcher is more effective for the achievement in science of ninth standard students.

Vandana (2008) reported an article named E learning pedagogies: new approaches to teaching and assessment. The author stated the need to incorporate e learning in teacher education programs. The author asserts that once the teacher feelsconfident about the e learning strategies they would use them in their teaching strategies.

Mohanthy (2008) wrote an article namedmultimedia approach to learning which stating that variety of resources starting from traditional media to the internet are now accessible.Theauthor says that teachers have to use their imagination , ingenuity and initiative if this store house of multimediais to be taken advantage of in the teaching learning process.

Jebaraj and Mohanasundaram(2008) conducted a study on the effectiveness of e content in teaching of physics at tertiary level. It was found that e content method is more effective than the conventional lecture method.

Chiniwar (2010)conducted study named A Study of Computer Assisted Instruction (CAI) in relation to students Achievement in English grammar. She founded that teaching English grammar through CAI is more effective in terms of enhancing achievement of students in English grammar.

 Raj (2010) studied the effectiveness of Computer Assisted Learning (CAL) multimedia on science Achievement. This study showed that the quality of science education and students achievement could be improved by utilizing CAL.

Kaur (2010) studied the effectiveness computer assisted instruction (CAI) in teaching of chemistry at secondary level. The findings of the study showed that the CAI is an effective media of instruction for teaching of chemistry at secondary level.

Srinivasalu and Vijayalakshmi (2010) studied the effectiveness of Computer Multimedia Package (SLM) on achievement in social science. The study showed that there was a superior performance of experimental group over the traiditional group which suggested that SLM (MMP) was found effective.

Demisia(2010) conducted the effectiveness of Computer Aided Learning (CAL) in teaching science concepts. The study found that CAL systems have made a lot of progress over recent years . It is quite evident that CAL is also one of the teaching methods than traditional method.

Rajendra (2010) had a research on the topic effect of 5E’learning on fifth grade students’ mathematics achievement. The main objective of this study was to investigate whether the meta-learning strategy of 5E’learning could be used to help students for meaning learning and improve their learning achievement in mathematics of class V learner. An important result of this study finds that learning mathematics through 5E’ cycle in the constructivist classroom enhanced particular understanding application and in general knowledge, skill as compared to traditional ways of teaching.

Rengarajan and Senthilnathan (2011) reported a study named teacher educators attitude towards e learning. The main aim of the study is to suggest measures to create/sustain/improve the teacher educators’ attitude towards e learning. The study had shown that there is wide scope for improving the teacher educators’ attitude towards e learning. Steps must also be taken to create a positive attitude in the minds of the teacher educators towards e learning.

Krishnan and Rajkumar (2011) reported an article named correlation between knowledge management and e learning : A perspective. They argued that in spite of some obstacles and limitations in the immediate implementation, it is clear that knowledge Management and e learning are the way of the future in the field of distance online education.

Tankha (2011) reported an article named Blended Learning Approach to Learning Mathematics. The author stated that blended learning , the combination of traditional face to face teaching methods with authentic online learning activities, has the potential to transform student learning experiences and outcomes. The blended learning model also allows for more creative and interactive course assignments.

Risila (2011) prepared a self instructional package on 9th standard topic organic chemistry by e content authoring. She concluded that ICT enabled software package will never replace the teacher. It improves the efficiency of educational system by increasing the rate, precision and value of learning.

Dutta (2012) reported an article named Blended Learning: A pedagogical approach to teach in smart classrooms. He concluded that blended learning models comprise of the following elements like learning through interaction, learning throughcollaboration and learning through classroom experiences mixed in varied proportions according to an organization’s requirements.

Aju (2012) conducted a study on the construction and validation of a self- instructional module on environmental sustainability for 8th standard students. It can be concluded that the SIM developed by the investigator is suitable for providing the essential environmental sustainability awareness for 8th standard students.

Thiyagu (2012) studied the effectiveness of Blog in Learning Mathematics at the secondary teacher education level. The result shows that the experimental group student is better than contril group students in their gain scores.

VandanaandPrerna (2013) conducted a study on the assessment of e-learning readiness among senior secondary school teachers in relation to their locus of control. It revealed that private senior secondary school teachers exhibited better scores than government senior secondary school teachers on e-learning readiness.

Dinesh and Amit (2013) reported an article named computer technology as an interactive teaching system: A new trend in education. This paper deals with the effective appropriate and interactive use of computer related technologies in the school and college level teaching system. They concluded that the interactive use of computer technology has dissolved the barriers between what students do and what teachers do.

**CONCLUSION**

 The review of these studied helped the investigator to acquaint with current knowledge in the area of the present study. These studies enlighten the researcher to proceed along the right path. The related studies in the concerned area revealed that there were no studies related to the development of e-content on the topic conic sections. Hence the present study has great relevance. The investigator hopes that study will prove beneficiary results.

 **Chapter 3**

**METHODOLOGY**

** Development of e-content**

** Research design**

** Tools used for the study**

** Sample selected for the study**

** Data collection procedure, Scoring and consolidation of data**

** Statistical Techniques used**

**METHODOLOGY**

 Methodology is generally a guideline for solving a problem, with specific components such as phases, tasks, methods, techniques and tools. For every piece of research work, the methodology is of vital importance. A suitable method helps the researcher to explore the diverse areas of the study.

 It is the analysis of the principles of methods, rules, postulates employed by a discipline. According to C.R. Kothari (1996) Research Methodology is a way to systematically solve the research problem. The truth is that, successful completion of a research work without proper planning becomes not only difficult, but will be impossible. The planning includes the measures are to be adopted for collecting the relevant data, sample to be taken, what controls are to be employed, and which would be the pertinent data that would be analyzed.

 The present study is an attempt to develop an e-content in mathematics based on the topic conic sections for plus one students. The methodology of the study is presented below under the following heads viz,

1. **Development of e-content**
2. **Research design**
3. **Tool used for the study**
4. **Sample selected for the study**
5. **Data collection procedure, scoring and consolidation of data**
6. **Statistical technique used**
7. **Development of the e-content.**

 The development of e-content involves three steps. The steps involve in the development of the e-content were under the following headings. Viz,

1. Planning of the content
2. Designing of e-content and
3. Implementation of e-content
4. **Planning of the Content**

 Mathematics is one of the difficult subjects for most of the school students. Their performance in mathematics is not satisfactory when compared to other subjects. This is because of the abstract nature of the subject, lack of motivation or in appropriate teaching method. Most of the teachers used mere chalk and talk method in teaching which is not so effective for all topics. The face-to-face conventional method is not suit for all topics especially the abstract concepts in mathematics. If the learning material is in the form of an e-content, it is very useful for masses to use from anywhere at any time. So the investigator decided to develop an e-content in mathematics based on the topic conic sections which is an abstract concept for plus one students.

1. **Designing of the e-content**

The steps involve in the designing of the e-content were listed below under the following heads. Viz,

* + - Preparation of the script
		- Script editing
		- Preparation of story board
		- Collection of visuals and pictures needed
		- Preparation for the narration
		- Video shooting
		- Video editing
		- Authoring

**Preparation of the script**

 First the investigator prepared a guideline for the development of script. The investigator developed a clear picture about the content and components of the script.

 For developing the script investigator analyzed the mathematics text book, handbook and syllabus related to the topic. Apart from this the investigator collected more details about the pedagogical analysis of the specified content and method of processing information.

 The investigator carefully examined the objectives of the lesson conic sections for class plus one. Then the chapter is divided into various modules based on the learning objectives.

 The script contained all the talks that teacher wants to tell in the classroom and the proper animation, graphics, images etc. The script prepared for the present study is given as appendix 1

**Script editing**

After writing the script, the investigator tried to correct it. The written script was presented before the subject and language experts and modifications were made based on their suggestions.

**Preparation of story** **board**

Storyboards are graphic organizers in the form of illustrations or images displayed in sequence for the purpose of pre-visualizing a motion picture, animation, motion graphic or interactive media sequence. First investigator prepared a blueprint that depicts settings, dialogue and action based on the script. Then the investigator made a rough sketch representation of the video. The storyboard contains all the rough figures of the visuals in the script. It helps the investigator to see what the scene will look like. Based on the prepared storyboard the investigator visualizes the concept and decided to proceed with the final stage.

**Collection of visuals and pictures needed**

The investigator collected visuals and pictures with the help of PC. Some visuals were browsed from the internet. Animation video was developed by a group of friends who are professionals in the field of animation. Text books, magazines and journals were used in the collection of pictures. Psychological aspects of learning were considered while collecting the learning materials. Microsoft power point, Microsoft word, internet explorer, HTML, flash and windows movie maker are the soft wares used. CD ROMs and pen drives are the secondary storage devices used.

**Preparation for narration**

Suggestions were taken from an e-content methodology expert regarding the style of narration. An interactive style of narration was adopted.

**Video shooting**

The investigator then picturised the narration with the help of a video-grapher. For this purpose a chroma flour was hired and the frames were shot one by one in fragments. Live sound recording was used for a realistic experience.

**Video editing**

Video editing was done using Adobe Final Cut Pro. The animation video, the narration, the illustrations developed and other collections from the internet were arranged sequentially. Visual effects were provided for the video to be more attractive.

**Software development and authoring**

 A standalone portable application was developed by a friend from the software engineering field. Sample e-content models from the website of UGC were provided to the developer as references. Microsoft .NET framework version 4.5 was used for creating the application. The home page contain eight menus viz, objective, summary, video/audio, text, assignment, reference, download, blog. The contents were connected to the respective menus.

1. **Implementation of the e-content.**

The prepared e-content was implemented by administering it in two classes of11th standard and comparing the entry behaviour and terminal behaviour of the students.

1. **Research design**

The present study has been conducted by employing an experimental design. A design is the blue print of the procedure that enables the researcher to test hypotheses by reaching valid conclusion about relationship between independent and dependent variables. (Best and Kahn,2001)

**Design selected**

 The design selected for the present study was the quasi experimental with pretest-posttest nonequivalent group design. Due to the inconvenience in random assignment of subjects in the experimental and control groups, intact classroom groups were selected for the study. The design of the study is illustrated as follows

O1 X O2

O3 C O4

Where O1,O3 = pretests

 O2, O4 = posttests

 X = application of experiment

 C = application of control treatment

Two class divisions from same school were treated as experimental and control groups. Experimental group was taught by e-learning strategy and duration of e-content was 25 minutes. The control group was taught by the existing method of teaching (constructivist method) for 3 periods of each having the same duration.

 Since the design selected for the present study was pretest-posttest nonequivalent group design, prior to the introduction of the two teaching methods, both group were administered the same achievement test.

**Variables in the study**

The experimental study consists of manipulating levels or amount of selected independent variables to examine their influence on dependent variable. The independent variable, dependent variable and control variable for the present study were follows.

1. Independent variable

The independent variable selected for the study was two teaching methods- e-learning strategy and constructivist method of teaching.

1. Dependent variable

Achievement in mathematics of plus one students was treated as the dependent variable.

1. Control variable

The variable controlled for the present study was the initial status of the students in terms of achievement in mathematics as measured by a pretest.

**Selection of the topic**

The topic for the experiment was selected from the new mathematics syllabus prescribed for plus one standard of Kerala state. The topic is conic sections and the sub headings in the e-content were follows

1. Introduction to conic sections
2. Circle
3. Ellipse
4. Parabola
5. hyperbola
6. **Tool used for the study**

The selection of the appropriate instrument or device requirement to collected data is the first step in an investigation. The selection or construction of suitable instrument or tool is vital importance for successful research. Different tools are required for collecting various kinds of information for various purpose.

 Tool used for the present study are following.

1. Achievement test in mathematics based on the topic conic sections.
2. Lesson plan based on constructivist approach
3. E –content in mathematics based on the topic conic sections.
4. **Achievement test in mathematics based on the topic conic sections.**

The test of achievement in mathematics based on the topicConicsection was constructed by the investigator to use as pre-test and post-test. The test was prepared after analysing the content of mathematics textbook of 11th standard. After planning the test, design and blue print was prepared and items were written as per blueprint. The items were edited and arranged psychologically with proper instructions. The details of different steps of test preparation are explained below.

**Planning**

 The investigator decided to construct one test for pre-test and posttest based on the design and blue print. The content for the test is in mathematics based on the topic conic sections for plus one students. The time limit for the test is 40 minutes with 30 marks.

**Design**

 Proper weightage was given to the objectives, content and difficulty level and each is presented below in detail.

Weightage to objectives

 Adequate weightage was given to objectives according to their importance. The objectives included and marks and the percentage of marks are given in Table 3.1

Table 3.1

Weightage to objectives

|  |  |  |  |
| --- | --- | --- | --- |
| Sl.No. | Objectives | Marks | Percentage |
| 1 | Knowledge | 7 |  |
| 2 | Understanding | 16 |  |
| 3 | Application | 5 |  |
| 4 | Skill | 2 |  |
|  | Total | 30 | 100 |

Weightage to content

 The investigator selected seven areas of content related to the essentials for learning mathematics at 8th standard level and weightage was given to each. Details are given in Table 3.2

Table 3.2

Weightage to content

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |  |
| --- | --- | --- | --- |
| Sl No. | Content | Marks | Percentage |
| 1 | Introduction to conic sections  | 3 |  |
| 2 | Circle | 5 |  |
| 3 | ellipse | 7 |  |
| 4 | parabola | 11 |  |
| 5 | hyperbola | 4 |  |
| Total  | 30 | 100 |

 |

Weightage to difficulty level

 To cater with the needs of children, questions which are easy, average, and difficult are to be included in the test. Approximate weightage to different levels of questions are given as Table 3.3

Table 3.3

Weightage to difficulty level

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No | Type of level | Number of questions | percentage |
| 1 | Easy | 6 |  |
| 2 | Average | 21 |  |
| 3 | Difficult | 3 |  |
| Total |  | 3 | 100 |

Blue print

 In order to make the design workable, a blue print was prepared, based on the above design of the test. The blue print is given as Table3.4

Table 3.4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  objectivescontents | Knowledge | Understanding | Application | Skill | Total |
| Introduction to conic sections  | 2(1) |  | 1(1) |  | 3 |
| Circle  | 1(1) | 4(1) |  |  | 5 |
| Ellipse | 1(1) | 4(1)  | 2(1)  |  | 7 |
| parabola | 2(1) | 5(1) | 2(1) | 2(1) | 11 |
| hyperbola  | 1(1) | 3(1) |  |  | 4 |
| Total  | 7 | 16 | 5 | 2 | 30 |

Note: The number inside the parenthesis indicates the number of questions and the number outside the parenthesis indicates the marks

Writing of items

 According to the requirements in the blue print, items were written and arranged in the order of difficulty with proper instructions. After proper editing and peer evaluation, the test was finalized.

 The test prepared on the basis of this blue print and its scoring key and marking scheme together with question wise analysis is given as Appendix 2 and 3.

**Reliability and validity**

Reliability and validity are two important constructs in the research.

Reliability

 The reliability of the test was established by test-retest method. For this achievement test was administered an a sample of 30 students of plus one standard. After three weeks, the same test was administered to the same students. After scoring the relationship between the two sets of scores was calculated using Pearson’s product-moment coefficient of correlation. The coefficient obtained is 0.78 which indicate the test scores are consistent over time.

Validity

 The test has content validity as it was prepared after thorough analysis of the selected content area. Suggestions of experts were sought and incorporated in the test.

**D. Sample selected for the study**

The sample in the process of validation of the prepared e-content was 11th standard students belonging to Kozhikode district of Kerala State. The e-content was validated on a sample of 76, 11th standard students from two divisions of same school of Kozhikode District.

Details of the sample of the study is given as Table3.5

Table 3.5

Breakup of the sample

|  |  |  |
| --- | --- | --- |
| Name of school | Division  | Number of students |
| G.V.H.S.S. Peringolam | A | 36 |
|  | B | 40 |

E. **Data collection procedure, Scoring and consolidation of data**

Before conducting experiment, both the experimental and control group were given the same pretest to measure the initial status of the subjects in terms of achievement in mathematics. After the administration of the pretest the experimental group was taught through the e-learning strategy and control group was taught through existing method of teaching (constructivist method).

 After the completion of the lesson, both the experimental and control group were given the same achievement test as posttest. The score on this test was used for determining the effectiveness of two teaching methods (e-learning and constructivist methods of teaching)

Scoring and consolidation of data

 All the answer sheets of the pretest and posttest which were correct in all respects were scored according to the scoring key. Scores of pretest and posttest of control group and experimental group were tabulated separately. The scores obtained for the selected variables were then consolidated for final analysis. The scoring key is presented as appendix 4.

F.STATISTICAL TECHNIQUES USED FOR THE STUDY

The statistical techniques used for analysing the data is

 Test of significance of mean difference for large independent samples using the formula



Where, = mean of the upper group for an item

  = Mean of lower group for an item

  = Standard deviation of the upper group for an item

  = Standard deviation of the lower group for an item

 N1 = Sample size of upper group

 N2 = Sample size of lower group.

 If the obtained Critical Ratio (t) is greater than the required tabled value at 0.05/0.01 level of significance, the mean difference is considered to be significant.

 (Garret, 2007)

 Chapter IV

ANALYSIS

Objectives

* Preliminary analysis

 Comparison of means

 Conclusion

ANALYSIS

 This chapter deals with the analysis of the data collected for validating the e-content developed by the investigator. The systematic analysis of the data will help to provide valuable information about the quality and effectiveness of the e-content.

The statistical analysis of the consolidated data has been based on the following objectives of the study.

Major objectives

(1)To prepare an e-content in mathematics based on the topic conic sections for plus one students.

(2)To validate the e-content in mathematics based on the topic conic sections for plus one students.

**Minor objectives**

1. To compare the mean pre-test scores between experimental and control group.
2. To compare the mean post-test scores between experimental and control group.
3. To compare the gain scores of experimental and control group.
4. To compare the mean pre-test post-test scores of experimental group.
5. To compare the mean pretest-posttest scores of control group.

 Analysis of the data has been done, classified and presented in the following order

I. PRELIMINARY ANALYSIS

II. COMPARISON OF MEANS

I. PRELIMINARY ANALYSIS

 The statistical properties of the variables in the study and the comparison of the mean scores of the relevant variables for the experimental and control group were done and presented in this section.

Important Statistical Constants

 As part of preliminary analysis important statistical constants like mean, median, mode, standard deviation, skewness and kurtosis for the pre-test, post-test and gainscores were examined separately for experimental and control groups and is pointed in Table 4.1 and Table 4.2 respectively.

TABLE 4.1

Statistical Constants of

Achievement in Mathematics for Experimental Group

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sl no | variables | Mean  | Median  | Mode | S.D | Skewness | Kurtosis |
| 1 | Pretest | 5.69 | 6.00 | 4.00 | 2.18 | -0.32 | -0.711 |
| 2 | Posttest | 26.75 | 27.00 | 27.00 | 2.59 | 0.43 | 2.48 |
| 3 | Gain scores | 21.06 | 21.00 | 19.00 | 2.897 | 0.598 | 0.195 |

TABLE 4.2

Statistical Constants of

Achievement in Mathematics for Control Group

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sl.no | variables | Mean  | Median  | Mode | S.D | Skewness | Kurtosis |
| 1 | Pretest | 5.63 | 5.50 | 5.00 | 2.067 | -0.336 | -0.252 |
| 2 | Posttest | 17.23 | 17.00 | 17.00 | 1.37 | -0.176 | -0.411 |
| 3 | Gain scores | 11.60 | 11.50 | 13.00 | 2.28 | -0.306 | -0.004 |

II. COMPARISON OF MEANS

 In this part of the Analysis, comparison of the mean scores of Achievement in Mathematics for experimental and control groups, in the pre-test, post-test and gain scores were attempted.

a) Comparison of mean Pre-test scores of Achievement in Mathematics for Experimental and Control Groups

 The mean scores of experimental and control groups on the pre-test were compared and studied using the test of significance of difference between means of large independent samples. The comparison was done for the sample in each of the experimental and control groups.

 The mean and standard deviation of pre-test scores of both of the group were found out and subjected to the test of significance of difference between means. The data and results of the t-test are presented in the Table 4.8

TABLE 4.3

Test of Significance of the

Mean Scores of Pretest between Experimental and Control Groups

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| group | N | Mean  | Standard deviation | t |
|  Experimentalcontrol | 3640 | 4.91674.7500 | 1.991051.77951 | 0.385 |

N.S = not significant at 0.05 level

 It can be seen from Table 4.3 that the obtained t-value is below the limit set of 0.05 levels at significance. So no significant difference is found in the mean pre-test scores of experimental and control groups for the Achievement in Mathematics.

 It can be inferred from the t-test that the performance of the experimental and control group are similar in case of their pre-experimental status of achievement measured in terms of pretests.

 The graphical representation of pre-test scores of experimental and control groups are presented in Figure 4.1

FIGURE 4.1

Bar diagram Representing

Pre-test Scores of Experimental and Control Groups

As per the Figure 4.1 it is noted that somewhat similar performance of the experimental and control groups in case of their pre-experimental status of Achievement as measured in terms of the pre-test. Results of the t-test confirmed the features in graphical representation of the comparison of pretest scores.

b) Comparison of the mean post-test scores of Achievement in Mathematics for Experimental and Control groups

 The mean performance of experimental and control groups on the post-test scores were studied and compared using the test of significance of difference between means of large independent samples. The comparison was done for the total sample in the experimental and control groups.

 The mean and standard deviation of the post-test of both the groups were found out and subjected to the test of significance of difference between means. The data and results of t-test are presented in Table 4.4

TABLE 4.4

Test of Significance of the Mean Scores

Of Post-test between Experimental and Control Groups

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| group | N | Mean  | Standard deviation | t |
|  Experimental control | 3640 | 26.750017.2250 | 2.589821.36790 | 20.332 |

 It can be seen from Table 4.4 that the obtained t-value is above the limit set for 0.01 level of significance. So there exist a significant difference in the mean post-test scores of experimental and control groups.

 It can be inferred from the results of the t-test that, the performance of the experimental and control group is different in the case of their post experimental status of Achievement in Mathematics measured in terms of a post-test. The graphical representations of post-test scores of Experimental and control groups are presented in Figure 4.2

FIGURE 4.2

Bar diagram Representing

Post-test Scores of Experimental and Control Groups

As per the Figure 4.2 it can be noted that there exist difference in the post-test scores of experimental and control groups. Results of the test confirmed the features in the graphical representation of the comparison of the post-test scores.

c) Comparison of the Mean Gain Scores of Achievement in Mathematics for Experimental and Control Groups

 The mean scores of Experimental and Control groups on the gain scores were studied and compared using the test of significance of difference between means of large independent samples. The comparison was done for the total sample in the experimental and control groups.

 The mean and standard deviation of the gain score of both the groups were found out and subjected to the test of significance of difference between means. The data and results of t-test presented in Table 4.5

TABLE 4.5

Test of Significance of the Mean Scores

Of Gain Score Between Experimental and Control Groups

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group | N | Mean | Standard deviation | t |
|  Experimental control | 3640 | 21.833312.4750 | 2.952001.67925 | 17.202 |

 The obtained t value as shown in Table 4.5 for the mean gain scores is greater than the tabled value required for significance at 0.01 level. This suggests that there is significant difference in the mean gain scores of Experimental and Control groups. So the gain performance of the experimental and control groups are dissimilar.

 High mean gain score for the Experimental group over the Control group for the total sample is noticed. This revealed the superiority of the experimental group over the control group in the case of gain scores.

 The graphical representation of Gain scores of experimental and control groups presented in Figure 4.3.

FIGURE 4.3

Bar diagram Representing

Gain Scores of Experimental and Control Groups

 As per the Figure 4.3, it can be noted that there exist difference in the gain scores of Experimental and Control groups. Results of the test confirmed the features in the graphical representation of the comparison of the gain scores.

1. Comparison of Mean of pretest-posttest scores of Achievement in Mathematics of Experimental group

The mean scores of pretest and posttest of Experimental group were studied and compared using the test of significance of difference between means of large independent samples. The comparison was done for the total sample in the experimental group.

 The mean and standard deviation of the pretest and posttest scores of experimental group were found out and subjected to the test of significance of difference between means. The data and results of t-test presented in Table 4.6

TABLE 4.6

Test of Significance of the Mean of pretest-posttest scores

of experimental group

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group |  N | Mean  | Standard deviation | t |
|  pretestExperimental posttest | 3636 | 4.916726.7500 | 1.991052.58982 | -40.101 |

 The obtained t value as shown in Table 4.6 for the mean pretest- posttest scores of experimental group is greater than the tabled value required for significance at 0.01 level. This suggests that there is significant difference in the mean pretest-posttest scores of Experimental group.

1. Comparison of Mean of pretest-posttest scores of Achievement in Mathematics of control group

The mean scores of pretest and posttest of control group were studied and compared using the test of significance of difference between means of large independent samples. The comparison was done for the total sample in the control group.

 The mean and standard deviation of the pretest and posttest scores of control group were found out and subjected to the test of significance of difference between means. The data and results of t-test presented in Table 4.7

TABLE 4.7

 Test of Significance of the Mean of pretest-posttest scores

of experimental group

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| group | N | Mean | Standard deviation | t |
|  PretestControl posttest | 4040 | 4.750017.2250 | 1.779511.36790 | 35.152 |

 The obtained t value as shown in Table 4.7 for the mean pretest- posttest scores of control group is greater than the tabled value required for significance at 0.01 level. This suggests that there is significant difference in the mean pretest- posttest scores of control group.

CONCLUSION

 The above results lead the investigator to arrive at the conclusion that the developed e-content is more helpful for the students to acquire the concept conic sections. Learners learn more deeply from animation and narration than from the narration alone. Moreover the e-content is successful for making learning more effective and the learning is relatively permanent among students

 Chapter 5

SUMMARY, FINDINGS, CONCLUSION AND SUGGESTIONS

 Study in Retrospect

* Variables used in the study

 Objectives of the study

 Methodology

 Major findings of the study

 Conclusions

 Educational implications

 Suggestions for further research

SUMMARY OF PROCEDURE,

CONCLUSION AND SUGGESTIONS

 This chapter gives an overview of the significant aspects of the stages of conducting the study, the important findings, their educational implications and suggestions for further research.

## I. STUDY IN RETROSPECT

 The various aspects related to the different stages of the present study like the problem, variables, objectives and methodology are given in a nutshell.

**a) Restatement of the Problem**

 The problem of the present study was stated as ‘DEVELOPMENTOF E-CONTENT IN MATHEMATICS BASED ON THE TOPIC CONIC SECTIONS FOR PLUS ONE STUDENTS’

**b) Variables Selected for the Study**

 The independent, dependent and control variables selected for the present study are the following:

* **Independent Variable:**

The independent variable selected for the study was two teaching methods- teaching through the developed e-content and constructivist method of teaching.

* **Dependent Variable**

Achievement in mathematics of plus one students was treated as the dependent variable.

* **Control Variable**

The variable controlled for the present study was the initial status of the students in terms of achievement in mathematics as measured by a pretest.

**c) Objectives of the Study**

 The present investigation was done with the following objectives.

**Major objectives**

1. To prepare an e-content in mathematics based on the topic conic sections for plus one students.

 2. To validate the e-content in mathematics based on the topic conic sections for plus one students.

**Minor objectives**

1. To compare the mean pre-test scores between experimental and control group.

2. To compare the mean post-test scores between experimental and control group.

3. To compare the gain scores of experimental and control group.

4. To compare the mean pre-test post-test scores of experimental group.

 5. To compare the mean pretest-posttest scores of control group.

**METHODOLOGY**

 The pretest-posttest non-equivalent-group design was used for the study. The development of e-content involves three steps.

The steps followed are

• Planning of the content

• Designing of e content and

• Implementation of e-content

**Planning of the Content**

 The investigator analyzed the present mathematics text books and hand books for 11th standard and locate the area conic sections in which most of the students feel tough in understanding the concept.

**Designing of the content**

 The steps followed are

* Write a script
* Correct it
* Collect all visuals and pictures needed
* Prepare a story board
* Prepare for the narration
* Video shooting
* Edit the video
* Authoring

**Implementation of the e-content**

The prepared e-content was implemented by administering it in two classes of 11th standard and comparing the entry behaviour and terminal behaviour of the students.

**Sample**

 The participants in the process of validation of the prepared e-content were plus one students belonging to Kozhikode District of Kerala State. The software was validated on a sample of 76 plus one students from two schools.

**Tool used**

 The investigator developed an e-content on the topic conic sections for plus one students. The investigator also developed an achievement test under the supervision of the guide on the basis of the topic conic sections.

**Statistical techniques used**

The data collected was analyzed using test of significance of mean difference for large independent samples.

**Major Findings of the study**

**The major findings of the study are given briefly in this section.**

**a) Comparison of Mean Pre-test Scores of Achievement in mathematics for Experimental and Control Groups for total sample.**

 **No significant difference between mean pre-test scores of experimental and control groups were noticed. Both of the groups were found equivalent in terms of pre-test scores. t-value of test of significance for pre-test scores is given in the Table 5.1**

**TABLE 5.1**

**t-value of the Test of Significance of Difference**

**between Experimental and Control Groups for Pre-test Scores**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Variables**  | **Sample**  | **t-value**  |
| **1.** | **Pre-tests** | **Total** | **0.385** |

**b) Comparison of the Mean Post-test Scores of Achievement in mathematics of Experimental and Control Groups for Total Sample.**

 **Significant difference in the mean post-test scores between experimental and control groups were noticed. The obtained t-value is given in the table 5.2**

**TABLE 5.2**

**t-values of the Test of Significance of Difference**

**between Experimental and Control Groups for Post-test Scores**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Variables**  | **Sample**  | **t-value**  |
| **1.** | **Post-tests** | **Total** | **20.332** |

**c) Comparison of the Mean Gain Scores of Achievement in mathematics of Experimental and Control Groups for Total Sample.**

 **The obtained t-value for the gain scores of total sample is found to be significant. The t-values of this test are presented in Table 5.3**

**TABLE 5.3**

**t-values of the Test of Significance of Difference**

**between Experimental and Control Groups for Gain Scores**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Variables**  | **Sample**  | **t-value**  |
| **1.** | **Gain scores**  | **Total** | **17.202** |

d) Comparison of Mean of pretest-posttest scores of Achievement in Mathematics of Experimental group

The obtained t-value for the pretest-posttest scores of experimental group is found to be significant. The t-values of this test are presented in Table 5.4

TABLE 5.4

t-values of the Test of Significance of Difference

between pretest-posttest scores of experimental group

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | Variables  | Sample  | t-value  |
| 1. | Pretest-posttest scores | Experimental group | -40.102 |

Significant difference in the mean pretest-posttest scores of experimental group were noticed. The obtained t-value is -40.102

e)Comparison of mean of pretest-posttest scores of control group were noticed.

 Significant difference in the mean pretest-posttest scores of control group were noticed. T-value of the test of significance is 35.152 which is presented in table 5.5

TABLE 5.5

t-values of the Test of Significance of Difference

between pretest-posttest scores of control group

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | Variables  | Sample  | t-value  |
| 1. | Pretest-posttest scores | control group | 35.152 |

CONCLUSION

Among five mean comparisons, four values were found to be significant. Only the mean comparison between pre-test scores of experimental and control groups was not significant. The values obtained by test of significance of difference between means of experimental and control groups for post-tests and gain scores for total sample were highly significant. Hence, we can conclude that the pupils taught through the developed e-content have achieved more than that of the control group. So it can be concluded that the e-content developed by the investigator is suitable for providing effective learning among students. It’s hoped that there would be wider application of e-learning packages developed for specific topics and subjects for more effective knowledge transaction at school level.

EDUCATIONAL IMPLICATIONS OF THE STUDY

 The present investigation was to develop an e-content in mathematics based on the topic conic sections for plus one students. The major findings of the study and the conclusion drawn from the findings helped the investigator to convey the importance of IT enabled learning. The study revealed that the teaching through e-content or e-learning strategy has its effects not only on the achievement in mathematics but also the pupil’s involvement in the classroom learning.

The learners learn more deeply from animation and narration than from narration alone. The theoretical rationale between these theories is that learners able to build better mental connections between corresponding words and pictures when both are presented (animation and narration) than when only one is presented (narration), and the learner must mentally create the other. Also the learners learn more deeply when an onscreen text is presented next to the portion of the animation and they are able to make better mental connections when corresponding words and pictures are in working memory at the same time.

The world is changing rapidly. Now the challenge of teaching is to help the students to produce maximum output within short time period. So special training programs may be included in the curriculum of teacher training courses which may help the future teachers to use computer technology for the instructional purpose. Refreshers courses, specialized training, orientation classes, seminars and workshop should be conducted for the teachers in order to improve their quality in using technology for teaching-learning process.

In short learning through e-content would any way be a remediation in solving the problem of time management which is ought to be great hurdle before the learner and the teacher.Using technology in the classroom is no longer an extra tip to the computer room; technology becomes a part of everyday practice.

 SUGGESTIONS FOR FURTHER RESEARCH

While conducting the present study the investigator came across many related topics that need attention. Based on that information the following are the suggestions for the further research.

1. Development of e-content on different topics in mathematics at different levels.
2. The study can be extended to other disciplines like science and languages.
3. This type of study may also be taken up for examining the interaction effects among methods, socio economic status etc.
4. Studies can be conducted to find the effectiveness of e-content on fast learners, under achievers,gifted learners and slow learners.
5. A study on difficulties faced by teachers in developing e-content.
6. Attitude of teachers and students towards e-learning.
7. A study on the relationship between mathematics and technology.
8. A study on the awareness of teachers on the innovative teaching strategies.
9. Effectiveness of software development training programme in developing e-content modules.

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