Chapter - I

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CHAPTER – I
INTRODUCTION

1.1 Education

Public strongly believes that our schools and colleges imparts holistic education. There is a doubt that some kinds of uncritical knowledge are imparted to pupil. Pupils are made to copy notes, learn them by heart, and reproduce them during the examinations. Those who learn by heart and reproduce them in exact letter are considered as the best. Others who do not succeed in this exercise are termed failures. Present society thus relates the education with the academic achievement alone. The examination results are all a grading in memory work which is a part of education and not the whole. An educated person is one who has developed qualities of mind and heart and who can critically evaluate things and objectivity decide the course of his action based on factual information. This is the product that education is expected to yield. So the “education is the aggregate of all the processes by means of which a person develops abilities, attitudes and other forms of behaviour of positive value in the society in which he lives”

As the society is changing, education as a tool, again helps him to acquire relevant new habits and practice. The impressions that pupils gather in the years of their academic life are important for their future. In fact attitudes towards life are built on what is happening in the academic institution. This concept is clear from the definition of Education - “education refers to the art of deliberately and purposefully influencing and / or shaping the behaviour of children, adolescents, and adults”

Education in the widest sense, consist of a universe of practical problems dealing with upbringing and teaching. These problems could be solved and quality in education could be increased by conceptualizing and implementing more effective and efficient
instructional processes. Instructional processes are to be developed from the new discoveries about learning and teaching.

1.2 Computers in Education

Computers can be used in an educational environment in three ways;

(i) to assist teachers

(ii) to instruct learners and

(iii) to help in managing the institution.

The first two uses will be based on own interest, in using computer as a potential tool to aid the teaching-learning process. As an instructional tool, it can play two different roles:-

Role (i) : Deliver instructions directly to pupils by allowing them to interact with the learning materials already programmed into the system.

Role (ii): Manage information about learners performance and learning resource options in order to prescribe and control individualised instruction.

1.3 e-Learning

One of the innovative applications of computer in the teaching and learning process is known as e-Learning. Also it is considered to be highly superior to CAL (Computer Assisted Learning). e-Learning allows you to learn anywhere and usually at any time, as long as you have a properly configured computer. e-Learning can be CD-ROM-based, network-based; Intranet-based or Internet-based. It can include text, video, audio, animation and virtual environments. It can be a very rich learning experience that can even surpass the level of training you might experience in a crowded classroom. It is self-paced, hands-on learning. The quality of the e-Learning, as in every form of training, is in its content and its delivery. e-Learning can suffer from many of the
same pitfalls as classroom training, such as boring slides, monotonous speech, and little opportunity for interaction. The beauty of e-Learning, however, is that new software allows the creation of very effective learning environments that can engulf you in the material.

1.3.1 e-Learning: Definitions

There are several ways to define e-Learning, depending on the context in which it is used-like: the purpose or goals; the type of tools; the type of techniques.

- **e-Learning** is the convergence of learning and the Internet.
- **e-Learning** uses the power of networks, primarily those that rely not only on Internet technologies but also satellite networks, and digital content to enable learning.
- **e-Learning** is the use of network technology to design, deliver, select, administer, and extend learning.
- **e-Learning** is based on Internet, components can include content delivery in multiple formats, management of the learning experience, and a networked community of learners, content developers and experts. e-Learning provides faster learning at reduced costs, increased access to learning, and clear accountability for all participants in the learning process. In today’s fast-paced culture, organisations that implement e-Learning provide their workforce with the ability to turn change into an advantage.

Let us study some definitions and understand the term from various perspectives.

Rosenberg (2001) defines ‘e-Learning as the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance’ It is based on three criteria as follows:

- It is networked and lends itself to instant updating, storage/retrieval, distribution
and sharing of instruction or information.

- It is delivered to the learner via standard Internet technology.
- It focuses on the broadest view of learning by accommodating different ways of acquiring knowledge.

According to the Organisation for Economic Co-operation and Development (OECD) (2004) e-Learning comprises four categories:

- Web supplemented: Here, the course outline and lecture notes are made available online, email is used and there are links to external online resources.
- Web dependent: Pupils are required to use the Internet for key ‘active’ elements of the programme, for example, for online discussions, assessment, online project/collaborative work, but without significant reduction in classroom time.
- Mixed mode: Classroom time is reduced but not eliminated. The reduced classroom time is replaced by online activities like online discussions, assessment, online project/collaborative work.
- Fully online: the terms ‘online learning’ and ‘e-Learning’ are used synonymously.

Clark and Mayer (2003) define e-Learning as instruction delivered on a computer through a CD-ROM, Internet or Intranet with the following features:

- It includes content relevant to the learning objectives.
- It uses instructional methods, such as examples and practice, to help learning.
- It uses media elements, such as words and pictures, to deliver the content and methods.
- It may be instructor-led (synchronous learning) or designed for self-paced individual study (asynchronous learning).
- It builds new knowledge and skills linked to individual learning goals or to improved organisational performance.
This definition clearly explains the ‘how’, ‘what’ and ‘why’ aspects of e-Learning. “The ‘e’ in e-Learning refers to the ‘how’: the course is digitised so it can be stored in electronic form. The ‘learning’ in e-Learning refers to the ‘what’: the course includes content and ways to help people learn it; and the ‘why’ refers to the purpose of helping individuals achieve educational goals or in helping organisations build skills related to improved job performance” (Clark and Mayer, 2003).

e-Learning is instruction that is delivered electronically, in part or wholly via a Web browser, through the Internet or an intranet, or through multimedia platforms such as CD-ROMs or DVDs (Hall, 1997).

e-Learning covers a wide set of applications and processes, such as Web-based learning, computer-based learning, virtual classrooms and digital collaboration. It includes delivering content via the internet, intranet/extranet (LAN/WAN), audio and video, satellite broadcast, interactive TV and CD-ROM (ASTD, 2001).

### 1.3.2 Different Types of e-Learning

**Online learning**

This type of the e-Learning uses the courseware that is delivered over the Internet to learners at a variety of locations, where the primary interaction between the learner and the experiences of their learning occurs via networked computer technology. Increasingly, learning management systems are beginning to serve as the basis for building online programmes wherein the learning experience is entirely mediated through a digital interface.

**Blended learning**

This type of e-Learning refers to the blending of multiple modes of delivering learning. It is also known as hybrid learning. Based on the design of the learning, blended learning can have a mix of different environments such as the classroom, the Web and the
virtual classroom. In this type of learning, one can make use of different delivery technologies and tools such as mobile phones, handheld devices, laptop or desktop computers and televisions.

**Virtual classroom**

The objective of this type of e-Learning is to extend the traditional classroom structure by moving it beyond the physical campus to learners spread across different geographical regions. It is helpful for those who pursue their learning in the distance mode as the course is entirely accessible through online. They would benefit as that of a real-time interaction with other learners and faculty through the Internet.

**Mobile and ubiquitous learning**

This type of e-Learning is extremely flexible by doing away with desktop dependency and by leveraging ubiquitous networks and portable digital devices, such as laptop computer, PDAs, MP3 players, gaming devices and mobile phones. Since these devices are very handy, one can use them by combining informal and formal learning experiences.

**CD-ROM and kiosk-based learning**

Besides the CD-ROM and DVD that can be played on computers and televisions, e-Learning can also be designed and delivered through touch-screen kiosks. This is useful when there is no dependence on the Internet and when the content has a long shelf-life or deals with generic topics. Since kiosks require simple user interaction for accessing information, it meets the learning needs of an audience with low computer literacy levels.

**1.3.3 Categories of e-Learning**

e-Learning falls into four categories, from the very basic to the very advanced. The categories are:
• **Knowledge databases:** While not necessarily seen as actual training, these databases are the most basic form of *e-Learning*. The user have probably seen knowledge databases on software sites offering indexed explanations and guidance for software questions, along with step-by-step instructions for performing specific tasks. These are moderately interactive, i.e., the user can either type-in a keyword or phrase to search the relevant data in the database, or can make a selection from an alphabetical list.

• **Online support:** Online support is also a form of *e-Learning* and functions in a similar manner to knowledge databases. Online support comes in the form of forums, chat rooms, Blogs, online bulletin boards, e-mail or live instant-messaging support. Slightly more interactive than knowledge databases, online support offers the opportunity for more specific questions and answers, as well as more immediate answers.

• **Synchronous training:** Synchronous training is real-time training. It resembles a meeting or face-to-face classroom training in that all learners go through the course at the same time. Through the Web, an instructor and students can be logged into the same place at the same time and interact more or less simultaneously. Examples include web seminars, on-line chat like AOL Instant Messenger, video, satellite, or teleconferencing, Microsoft NetMeeting, and similar tools. The major benefit of synchronous training is that everyone is together in a classroom-type environment. The biggest drawback is that everyone has to be together at the same time, which may be a problem across time zones, jobs shifts, and personal schedules.

• **Asynchronous training:** Asynchronous training is training that is not dependent on time or location (real or virtual). This type of training may be self-study or instructor-led. Examples include this course, a typing skills course, an on-line C++
programming course, and many of the on-line courses offered by colleges and universities. The self-study method has the learner working largely on their own. This requires a great deal of learner self-motivation, since the instructor is not a regular part of the picture. This method is very effective when teaching skills that do not require a high degree of interaction between the learner and the instructor and/or other learners. A correspondence course is also a self-study asynchronous course, although not interactive in the e-Learning sense. Instructor-led asynchronous training includes regular interaction with the instructor and possibly other students, using e-mail, bulletin boards, and similar tools. The distinction is that while all learners interact with each other, they do it on their own time and schedule.

1.3.4 Important features of e-Learning

The following are some of the important features of e-Learning.

a) e-Learning is dynamic: Today’s content, in real time, not old news or “shelf ware”

Online experts, best sources, quick approaches for emergencies.

b) e-Learning operates in real time: e-Learner get what he/she need, when he/she need it.

c) e-Learning is collaborative: Because people learn from one another, e-Learning connects learners with experts, colleagues, and professional peers, both in and outside your organization.

d) e-Learning in individual: Every e-Learner selects activities from a personal menu of learning opportunities most relevant to his/her background, job, and career at that very moment.
c) *e-Learning* is comprehensive: *e-Learning* provides learning events from many sources, enabling the e-learner to select a favoured format or learning method or training provider.

### 1.3.5 Components to be included in e-Learning

*e-Learning* can incorporate many elements that make learning new material, anew process or a new programme more fun. Making learning more interesting & fun is what making this *e-Learning* more effective. If you aren’t pulled into the material, you really aren’t learning as well as you could be. This is what makes *e-Learning* so great for so many types of learning. Obviously, every type of training can’t be turned into e-Training, but many can with excellent results. The components that are to be included to make *e-Learning* successful are:

- Varying the types of content – Images, sounds and text work together to build memory in several areas of the brain and result in better retention of the concept being learnt.
- Creating interaction that engages the attention – Games, quizzes and even just required manipulation of something on the screen creates more interest, which in turn builds better retention.
- Providing immediate feedback – *e-Learning* courses can build in immediate feedback to correct misunderstood material. The most immediate feedback is better as each step of learning builds upon the previous step. If no feedback is given, then the next step may be building upon an incorrect interpretation.
- Encouraging interaction with other e-Learners and an e-Instructor – Chat rooms, discussion boards, instant messaging and e-mail all offer effective interaction for e-learners, and do a good job of taking the place of classroom discussion.
Building an online community significantly influences the success of online programs.

1.3.6 Benefits of e-Learning

e-Learning has definite benefits over traditional classroom training.

Time

One of the key benefits of online study is that the students can access course material whenever it is convenient for them. Podcasts and downloadable lectures mean that students are no longer constricted by a conventional timetable of lectures.

Location

Neither are students restricted by their physical location. With an Internet connection, they can attend live online tutorials, participate in dedicated discussion forums or download course material and notes regardless of where they are. This saving on the time and cost of travelling to and from lectures makes online study particularly suitable for those with busy lifestyles and those who do not live within easy commuting distance of conventional centres of education.

Communication

Another key advantage of online study is that it encourages and enables students to collaborate and communicate with their fellow students as well as their tutors. The innovative use of live online tutorials, discussion forums and e-mail ensures that all members of the student community are constantly in touch with each other.

Flexible Class Schedules

Flexible class scheduling allows for a student to receive instruction when it best fits his or her needs. This can be especially beneficial to those with full-time jobs, who travel a lot or have family responsibilities. Taking a course on one's own schedule also allows a student to choose a time when he or she is most alert and best able to absorb
the information. Many online degree programs offer course material, such as lectures and previous class discussions, for review 24 hours a day, seven days a week.

**Virtual Access to Instructors and Classmates**

Online technologies, such as chat rooms, may allow for easier interaction between students and instructors in a virtual classroom. Individuals can answer questions and make comments at their own pace. Students who are shy or feel intimidated in a large on-campus class may find it easier to participate in virtual discussions with fellow classmates from the comfort of their own home. The use of chat rooms and newsgroups may also make it easier for students to meet for group projects, eliminating the need to go to a mutually decided location.

Through the use of chat rooms or Web applications, such as Blackboard, online students might have more 1-on-1 interaction with a teacher virtually than they have directly in a large, traditional classroom setting. In many cases, such online interactions may make the teacher more easily accessible when it comes to general discussion and getting questions answered. Not only do students have access to the same instructors teaching courses on campus, they often receive instruction from teachers located in other parts of the country or even around the world.

The end result for the student is an “anytime anywhere” educational experience ideal for those who do not have the time to spend travelling to and from lectures at set times and locations.

**1.4 Mathematics**

Mathematics is a man-made science. The term Mathematics has been interpreted and explained in various ways. According to one of the dictionaries “Mathematics is the science of number and space” while the others have defined it as “the science of measurement, quantity and magnitude” These definitions clearly indicate that
Mathematics is an accepted science which deals with the quantitative aspects of our life and knowledge.

According to New English dictionary “Mathematics in a strict sense is the abstract science which investigates deductively the conclusions implicit in the elementary conceptions of spatial and numerical relations” Its Hindi name is ‘Ganita’ which means the “science of calculation”

Mathematics is the numerical and calculation part of man’s life and knowledge. It helps man give the exact interpretation to his ideas and conclusion. It deals with quantitative facts and relationships as well as with problems involving space and form.

Mathematics is a sequence subject. It is difficult to follow a topic when the topics that have been dealt with earlier are not properly understood, for example, one cannot follow multiplication and division unless he knows addition and subtraction respectively. Similarly, simple interest and compound interest cannot be understood unless one knows percentage.

Mathematics is an exact science and it involves high cognitive abilities and power. Mathematical results are not derived from mere observations and verifications or by accident, but they are outcomes of an intelligent intuition and inspiration.

Mathematics trains the child to see relationships to generalize and to use the experience of one situation in a new with a similar situation. Mathematics trains the mind to think in abstract terms.

Mathematics is a universal language. It breaks through language barriers and creates bonds of friendship among the nations.

Mathematics is an integral part of the universe whose every aspect is quantitative.
1.5 The place of Mathematics in everyday life

Shut out Mathematics from daily life and all civilization comes to a standstill. In this world of today nobody can live without Mathematics for a single day. Mathematics is intimately involved in every moment of everyone's life. Right from human existence on this earth, it has been a faithful companion. When man first wanted to answer the question: (How many? How much? How big? How long? etc.) he invented arithmetic. Algebra was devised to simplify arithmetic computations. For measurement geometry was invented. To find the position of high mountains and stars trigonometry was invented and developed and so on in the case of numerous other branches of Mathematics. The knowledge of this subject was born out of felt needs of man. This knowledge is therefore indispensable, and as the needs grow, the knowledge is bound to grow.

There is a definite need of Mathematics in anybody's day-to-day planning and life-long planning. A human being is always after profitable and increasing returns. A mathematical approach is essential for any progress. Any approach devoid of mathematical considerations is likely to lead to failure. If anybody wants to make a success of his life, he must have recourse to Mathematics.

Day-to-day evaluation in life or daily self-evaluation and overall life-evaluation provide us assessment, judgment, guidance and direction for the future. This evaluation will have to be mathematical in nature to a great extent.

Even the most ordinary citizen has got to calculate his wages and buy things from the bazaar. A person may be a mere a housewife, farmer, labourer, shopkeeper, tailor, clerk, vendor, salesman, accountant, mason, driver, carpenter or booking clerk, some knowledge of Mathematics is absolutely necessary for all of them.

The entire atmosphere is surcharged with Mathematics. The prices, rates, discounts, commissions, rebates, interests, taxes, shortages, production, distribution,
inflation, etc., are the issues with which everybody is intimately concerned. There is no escape from mathematical intricacies of life and livelihood.

1.6 The place of Mathematics in the school curriculum

Everybody needs some knowledge of Mathematics in one way or the other. But it is felt that for an ordinary man, the knowledge acquired during the primary and middle stages will suffice. Consequently there is a great controversy over making it optional or compulsory at the high/higher secondary school stage.

It is also believed that Mathematics is an exceptionally difficult subject, i.e., its study requires special ability and intelligence; therefore everybody should not be burdened with the study of this tough subject; everybody is not capable enough to learn it successfully; References are there for the low passing percentage in this subject in examinations.

Mathematics is a very useful subject for most vocations and higher specialised courses of learning. But everybody who is studying it in the school is not going to be an accountant, engineer or statistician. But at such an early stage of education it is difficult to know who is going to be an engineer or a banker. Therefore the duty of the school is to give to the high school pupil a broad view of what he is capable of achieving in future. He should get a broader course to be able to choose a suitable line out of that. At the university stage, most of the physical and social sciences require the application of Mathematics. To deprive the pupils' knowledge on this subject at the high school stage means narrowing the choice of vocation for him. Ignorance of Mathematics will be a great handicap in the progress of his studies in many other subjects. High/higher secondary school education will remain incomplete and incomprehensive if Mathematics is excluded from it. No other subject can be a substitute for Mathematics.
Educationists have begun to feel that education upto the middle standard is not sufficient for the citizens of today. The period of compulsory education needs extension from the middle to the high school level. Naturally on the extension of the period of compulsory education from eight to ten or eleven years, Mathematics will have to be retained as a compulsory subject for the longer duration of compulsory education, then the question of making it optional at high/higher secondary stage will not arise at all.

While making it compulsory, the interests of both types of pupils will have to be safeguarded. So the syllabus shall contain such subject-matter as is useful for those who are going to discontinue their education after the high school stage and are entering into other professions. It shall also contain such knowledge as elucidates mathematical principles and processes so that the pupils who will later join a university class, shall not be then handicapped at the sudden rise in standard.

There cannot be two opinions in the necessity of diversification and specialisation at the plus two stage. Here Mathematics has to be treated as an optional and specialised subject like other subjects of study.

One should not forget that during the age of education of 3 R’s (Reading, Writing, Arithmetic), Mathematics was one of the three, rather two, subjects of study; its importance in the present age is no less. There can be no true schooling without Mathematics.

1.7 Aims of teaching Mathematics

We can prepare a long list of aims of teaching Mathematics. These aims pertain to the entire school stage. Apart from enabling the pupils to acquire essential mathematical knowledge, skills, interests and attitudes, the teaching of Mathematics has to help them in many ways:
a) **Utilitarian aim**

Mathematics will be taught primarily for its practical values and aims. The pupil will be given mathematical knowledge and skills needed in his day-to-day life and enabled to make use of that knowledge and skill. This aim makes the study of Mathematics functional and purposeful that establishes relation between the subject and practical life.

b) **Disciplinary aim**

The subject has also to be taught for its disciplinary and intellectual values. It has to aim at providing training to the mind of the learner and developing intellectual habits in him.

c) **Cultural aim**

This aim helps the learner to understand the contribution of Mathematics in the development of civilisation and culture. It has enabled him to understand the role of Mathematics in fine arts and in beautifying human life.

d) **Adjustment aim**

It is to help the learner to develop a healthy, purposeful, productive, exploratory and controlling adjustment with environment.

e) **Social aim**

It is to help the learner to imbibe essential social virtues.

f) **Moral aim**

It enables the learners to imbibe the attributes of morality.

g) **Aesthetic aim**

It is to develop their aesthetic sensibilities, meet their varying interests and help them in the proper utilisation of their leisure time.

h) **International aim**

To develop in them international outlook and understanding.
i) Vocational aim

It is to prepare them for technical and other vocations where Mathematics is applied.

j) Inter-disciplinary aim

To give them insight into the application of Mathematics in other subjects.

k) Self-education aim

It is to help them to become independent in learning.

l) Educational preparation aim

It is to prepare them for higher education in sciences, engineering, technology, etc.

m) Development of powers aim

It pertains to the development of powers of thinking, reasoning, concentration expression, discovery, etc.

n) Harmonious development aim

Ultimately the overall aim of teaching all the subjects including Mathematics is to ensure all-round and harmonious development of the personality of the child.

1.8 Objectives of teaching Mathematics at the school level

The objectives of teaching Mathematics at the entire school stage or secondary stage may be classified as under:

a) Knowledge and understanding objectives.

b) Application objectives.

c) Skill objectives.

d) Attitude objectives.

e) Appreciation and interest objectives.
To make them unambiguous and attainable, these objectives are further expressed in behavioural terms. What the pupil is expected to achieve is clearly known to the teacher in the form of desirable behavioural changes. Different objectives along with the relevant behavioural changes are given below:

a) **Knowledge and understanding objectives:** The pupil acquires knowledge and understanding of:

- Language of Mathematics, i.e., the language of its technical terms, symbols, statements, formulae, definitions, logic, etc.
- Various Concepts, i.e., concept of number, concept of direction, concept of measurement etc.
- Mathematical Ideas, like facts, principles, processes and relationships.
- The development of the subject over the centuries and contributions of mathematicians.
- Inter-relationship between different branches and topics of Mathematics, etc.
- The nature of the subject of Mathematics.

b) **Application objectives:** The subject helps the pupil to apply the above mentioned knowledge and skills in the following way:

- Pupil is able to solve mathematical problems independently.
- Pupil makes use of mathematical concepts and processes in everyday life.
- Pupil develops ability to analyse, to draw inferences, and to generalise from the collected data and evidence.
- Pupil can think and express precisely, exactly, and systematically by making proper use of mathematical language.
- Pupil develops the ability to use mathematical knowledge in the learning of other subjects especially sciences.
• Pupil develops the pupils’ ability to apply Mathematics in his future vocational life.

c) Skill objectives: The subject helps the pupil to develop the following skills:

• Pupil acquires and develops skill in the use and understanding of mathematical language.

• Pupil acquires and develops speed, neatness, accuracy, brevity and precision in mathematical calculations.

• Pupil learns and develops technique of problem-solving.

• Pupil develops the ability to estimate, check and verify results.

• Pupil develops the ability to perform calculations orally and mentally.

• Pupil develops ability to think correctly, to draw conclusions, generalisations and inferences.

• Pupil develops skills to use mathematical tools and apparatuses.

• Pupil develops essential skill in drawing geometrical figures.

• Pupil develops skill in drawing, reading, interpreting graphs and statistical tables.

• Pupil develops skill in measuring, weighing and surveying.

• Pupil develops skill in the use of mathematical tables and ready references.

d) Attitude objectives: The subject helps to develop the following attitudes:

• Pupil learns to analyse the problems.

• Pupil develops the habit of systematic thinking and objective reasoning.

• Pupil develops heuristic attitude and tries to discover solutions and proofs with his own independent efforts.

• Pupil tries to collect enough evidence for drawing inferences, conclusions and generalisations.

• Pupil recognises the adequacy or inadequacy of given data in relation to any problem.
- Pupil verifies his results.
- Pupil understands and appreciates logical, critical and independent thinking in others.
- Pupil expresses his opinions precisely, accurately, logically and objectively without any biases and prejudices.
- Pupil develops personal qualities, e.g., regularity, honesty, objectivity, neatness and truthfulness.
- Pupil develops self-confidence for solving mathematical problems.
- Pupil develops mathematical perspective and outlook for observing the realm of nature and society.
- Pupil shows originality and creativity.

e) Appreciation and interest objectives: The pupil is helped in the acquisition of appreciations and interests in the following way:

- Pupil appreciates the role of Mathematics in everyday life.
- Pupil appreciates the role of Mathematics in understanding his environment.
- Pupil appreciates Mathematics as the science of all sciences and art of all arts.
- Pupil appreciates the contribution made by Mathematics in the development of civilisation and culture.
- Pupil appreciates the aesthetic nature of Mathematics by observing symmetry, similarity, order and arrangement in mathematical facts, principles and processes.
- Pupil appreciates the contribution of Mathematics in the development of other branches of knowledge.
- Pupil appreciates the recreational values of the subject and learns to utilise it in his leisure time.
- Pupil appreciates the vocational value of Mathematics.
• Pupil appreciates the role of mathematical language, graphs and tables in giving precision and accuracy to his expression.
• Pupil appreciates the power of computation developed through the subject.
• Pupil appreciates the role of Mathematics in developing his power of acquiring knowledge.
• Pupil appreciates mathematical problems, their intricacies and difficulties.
• Pupil develops interest in the learning of the subject.
• Pupil feels entertained by mathematical recreations.
• Pupil takes an active interest in the activities of Mathematics club.
• Pupil takes an active interest in active library reading, mathematical projects and doing practical work in Mathematics laboratory.

1.9 Objectives at the secondary stage

These objectives are more or less the same as those enlisted for the entire school stage. Still the discussion can be supplemented as under:

a) Knowledge and understanding objectives:

• Pupil understands the inter-relationship of mathematical facts, formulae, principles and processes.
• Pupil understands the theoretical and abstract aspects of Mathematics.

b) Application objectives:

• Pupil learns the application of Mathematics in his day-to-day, social, vocational, occupational and recreational life.

c) Skill objectives:

• Pupil develops skill in solving the same problem by various possible methods.

d) Attitude objectives:

• Pupil gains confidence and competence in the learning of Mathematics.
e) Appreciation and interest objectives:

- Pupil enjoys solving mathematical problems of every type.

1.10 Interest Inventories

Interest Inventories attempt to yield a measure of the types of activities that an individual has a tendency to like and to choose. One kind of instrument has compared the subject’s pattern of interest to the interest patterns of successful practitioners in a number of vocational fields. A distinctive pattern has been discovered to be characteristic of each field. The assumption is that an individual is happiest and most successful working in a field most like his or her own measured profile of interest.

Another inventory is based on the correlation between a number of activities from the areas of school, recreation, and work. These related activities have been identified by careful analysis with mechanical, computational, scientific, persuasive, artistic, literary, musical, social service and clerical areas of interest. By sorting the subject’s stated likes and dislikes into various interest areas, a percentile score for each area is obtained. It is then assumed that the subject will find his or her area of greatest interest where the percentile scores are relatively high.

Interest inventories are examples of self report instruments in which individuals note their likes and dislikes. These self-report instruments are really standardized interviews in which the subjects, through introspection, indicate feelings that may be interested in terms of what is known about interest patterns.

Pupils are anxious to find-out about their interests and the inventories consist of items that tend to be psychologically non-threatening. The instability of pupils’ interest during elementary and high school years suggests that we should use interest inventories with extreme caution at these levels. Interest typically are not very stable until approximately age seventeen. This does not mean that we must wait until this age of
seventeen to measure interests but that our interpretations must be highly tentative. In one sense the instability of interests among children and adolescents is highly encouraging, for it indicates that our efforts to broaden and develop interests through school activities have some chance of succeeding. It is mainly when we are attempting to use them in carrier planning that stability poses a serious problem. For vocational decisions, we should rely most heavily on interest measures obtained during the last two years of high school and later.

Another precaution to keep in mind is not confuse interest scores with measures of ability. A strong interest in Mathematics, for example, may or may not be accompanied by the verbal and numerical abilities needed to pursue successfully a course of study or career in Mathematics. Interest measures merely indicate whether an individual is apt to find satisfaction in a particular type of activity. Measures of ability determine the level of activity at which the individual can expect to function effectively.

In this study “Interest in Mathematics” is analysed.

1.11 Attitude

Attitude presents an individual’s feelings for or against something. In other words the degree of the feeling favourableness or unfavourable towards some object, person, groups, institution or idea is called attitude.

There are various definitions of attitude. The following are some of the famous definitions of attitude.

Allport : “An attitude is a mental and neutral state or readiness, organised through experience, exerting a directive or dynamic influence upon the individual’s response to objects and situations with which he is related”

Newcomb : “A state of readiness for motive arousal”

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Thurstone: “An affect for or against psychological object”

Doob: “An implicit drive - producing response considered socially significant in the individual’s society”

1.11.1 Major characteristics of attitude

- It is a learned behaviour and it is not inherited.
- It is more or less permanent for a responsible period of time.
- It is directed towards an object or a goal.
- It can be indirectly inferred from once covert or overt behaviour.
- They are essential components of one’s personality.
- They represent the behaviour towards one object.

1.11.2 Methods of measuring attitude

- The direct questions are asked to know the idea of the pupils.
- The check list are prepared and it is given to the interviewer in order to fill up it. Knowing the answers of the persons the attitude of the persons are judged.
- The rating scales are used to measure the attitudes.
- Special texts, like scalogram analysis and situational test are used to measure the attitude.
- Thurstone’s scale of equal-appearing intervals and Likert’s method of summated rating are generally used to measure the attitudes.

“Attitude towards computer” and “attitude towards Mathematics” are also analysed in this study.
1.12 Achievement tests

The term achievement is often mainly understood in terms of pupils’ scores on a certain school subject. If for instance, a pupil is tested in two school subjects say Mathematics and Biological Science and in former he get 80% while in the latter 60% marks, it is understood that his achievement in Mathematics is better than his achievement in Biological Science. In other words, achievement means one’s learning attainments, accomplishments, proficiencies etc. According to Denis Baron and Harold W. Benard, the concept of achievement involves the interaction of the factors namely, aptitude for learning, readiness for learning and opportunity for learning. Achievement in education precisely speaking, implies one’s knowledge, understanding of skills in a specified subject or a group of subjects.

Achievement tests constitutes an important tool of evaluations. It is necessary for the teacher to know how for the pupils have attained in a particular subject area. In the school evaluation programme, various forms of achievement tests are used to measure the accomplishment of the pupils. “Any test that measures the attainments or accomplishments of an individual after a period of training or learning is called an achievement test” (N.M. Doconie)

super observes “An achievement or proficiency test is used to ascertain what and how much has been learnt or how will a task can be performed, the focus is on evaluation of the past without reference to the future, except for the implicit as assumption that required skills and knowledge will be useful in their own right in the future” In the words of Walirs “Achievement tests are useful aids for diagnosing a pupils’ specific learning needs, for identifying his relative strengths and weaknesses, for studying his progress and predicting his success in a particular curriculum” Of all the different types of tests, achievement tests are used most frequently.
1.12.1 Functions of achievement tests

- To provide basis for promotion to the next grade.
- To find-out at the beginning of the year where each pupil stands in the various academic areas.
- To help in determining the placement of a pupil in a particular section.
- To motivate pupils before a new assignment is taken up.
- To help the teacher too see for himself how effectively he is doing, what is getting across pupils’ and what is not.
- To help the teachers in identifying pupils’ difficulties and arranging for remedial measures.

1.13 Need for the study

Today we are in grey revolution, the advancement in science and technology has changed the role of education, the role of teacher is also changed the force of education. The teacher is only source of information; but today, teacher is one of the sources of information. The invention of Internet and World Wide Web opened the source of information for all. The paradigm shift in the field of education is from teacher-centric to learner-centric; and learner centre to be in the paradigm of any teacher of any level of education must adapt their relationship with the learner, switching from dispensing information to helping learners by guiding them rather than molding.

An appropriate educational technology in the hands of competent teachers can ensure better teaching learning process. At present the role of the teachers in educating the pupils has gained a paramount importance. The classrooms are over crowded, with heavy amount of syllabi, the pupils are expected to gain knowledge, to improve the levels of understandings, to develop the interests on pupils, to enrich meaningful development of independent study habit and to create purposeful development of self-confidence in
learning. An alternative process of teaching has to be adopted. Moreover, in fast developing world, where knowledge explosion is taking place in every sphere, it is unreasonable to expect that the spoken or written words alone could convey the volume of relevant information to the learner. Teaching and learning are the most important processes in our educational system. Learning is the process of changing behavioural tendencies of the learner. The method of teaching differs from teacher to teacher; their aim is to reach the goals. For this purpose, teachers use various techniques, plans and strategies, which can match the objectives of teaching, as well as, those of pupils learning. The teacher can select and use various techniques whenever and wherever required.

The use of such technology in the institutions will motivate the teaching community and create better learning conditions. Hence, keeping all these in view the researcher attempted an experiment to apply e-Learning in Mathematics at high school level.

1.14 Scope of the study

The scope of this study is restricted to Mathematics at high school level prescribed by Board of Secondary Education, Government of Tamilnadu. This study is primarily concerned to what extent the children have the interest in Mathematics and also about how much that the multimedia especially e-Learning influences the achievement in Mathematics. This study also composes the type of attitude towards computer and Mathematics at high school level.

1.15 Statement of the problem

The movement towards the Educational Technology and the interference of behavioral psychology influenced the field of teaching and learning. e-Learning, web-based learning, virtual learning and online learning are becoming popular in the field
of education. Knowledge packing and web casting have changed the traditional rigid classroom environment and learning materials. The problem under the present investigation is “A Study of the Effectiveness of e-Learning on pupils’ Achievement and Interest in Mathematics; Attitude towards Computer and Mathematics at High School Level”

1.16 Operational Definition of the key terms

e-Learning:

*e-Learning* comprises all forms of electronically supported learning and teaching. *e-Learning* applications and processes include Web-based learning, computer-based learning, virtual education opportunities and digital collaboration. Content is delivered via the internet, intranet/extranet, audio or video tape, satellite TV and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

Achievement:

The term achievement is often mainly understood in terms of pupils’ scores on a certain school subject. In other words, achievement means one’s learning attainments, accomplishments, proficiencies etc.

Interest:

The term Interest is the feeling of a person whose attention, concern or curiosity is particularly engaged by something. In other words, Interest means something that concerns, involves, draws the attention of, or arouses the curiosity of a person.

Mathematics:

Mathematics is the abstract science which investigates deductively the conclusions implicit in the elementary conceptions of spatial and numerical relations.
**Attitude:**

An attitude is a hypothetical construct that represents an individual's degree of like or dislike for something. In other words,Attitude is the inner feeling or belief of a person towards a particular phenomenon.

**Computer:**

A computer is a machine designed to sequentially and automatically carry out a sequence of arithmetic or logical operations that can be programmed. The particular sequence of operations can be changed readily, allowing the computer to solve more than one kind of problem.

**High School Level:**

The Secondary stage of school education in the hierarchy of educational level.

**1.17 Objectives of the study**

1) To develop instructional design for selected topics in Mathematics at high school level.

2) To develop suitable *e-Learning Package* for the selected topics in Mathematics at high school level.

3) To develop suitable *Criterion-Referenced test* for the selected topics in Mathematics at high school level.

4) To validate the *e-Learning Package* for the selected topics in Mathematics at high school level.

5) To validate the *Criterion-Referenced test* for the selected topics in Mathematics at high school level.

6) To study the effectiveness of *e-Learning* on pupil’s achievement and interest in Mathematics; attitude towards computer and Mathematics at high school level.
7) To find-out the significance of difference between the Pre-test and Post-test mean scores of the achievement in Mathematics of the experimental group and the control group.

8) To find-out the significance of difference between the Pre-test and Post-test mean scores of the interest in Mathematics of the experimental group and the control group.

9) To find-out the significance of difference between the Pre-test and Post-test mean scores in attitude towards Computer of the experimental group and the control group.

10) To find-out the significance of difference between the Pre-test and Post-test mean scores in attitude towards Mathematics of the experimental group and the control group.

11) To find-out the significance of difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to sex.

12) To find-out the significance of difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to parents' educational qualification.

13) To find-out the significance of difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to parents' occupation.

14) To find-out the significance of difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to parents' income.

15) To find-out the significance of difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to locality.
16) To find-out the significance of difference between the *Post-test* mean scores of the achievement in Mathematics of the *experimental group* with respect to study habit.

17) To find-out the significance of difference between the *Post-test* mean scores of the achievement in Mathematics of the *experimental group* with respect to the course on computer.

18) To find-out the significance of difference between the *Post-test* mean scores of the achievement in Mathematics of the *experimental group* with respect to the experience in using computer.

19) To find-out the significance of difference between the *Post-test* mean scores of the achievement in Mathematics of the *experimental group* with respect to participation in computer games.

20) To find-out the significance of difference between the *Post-test* mean scores of the achievement in Mathematics of the *experimental group* with respect to chances for using internet.

21) To find-out the significance of difference between the *Post-test* mean scores of the achievement in Mathematics of the *experimental group* with respect to experience in using internet.

22) To find-out the significance of difference between the *Post-test* mean scores of the *Interest in Mathematics* of the *experimental group* with respect to sex.

23) To find-out the significance of difference between the *Post-test* mean scores of the *Interest in Mathematics* of the *experimental group* with respect to parents’ educational qualification.

24) To find-out the significance of difference between the *Post-test* mean scores of the *Interest in Mathematics* of the *experimental group* with respect to parents’ occupation.
25) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to parents' income.

26) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to locality.

27) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to study habit.

28) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to the course on computer.

29) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to the experience in using computer.

30) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to participation in computer games.

31) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to chances for using internet.

32) To find-out the significance of difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to experience in using internet.

33) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to sex.
34) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to parents’ educational qualification.

35) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to parents’ occupation.

36) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to parents’ income.

37) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to locality.

38) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to study habit.

39) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to the course on computer.

40) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to the experience in using computer.

41) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to participation in computer games.

42) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to chances for using internet.
43) To find-out the significance of difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to experience in using internet.

44) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to sex.

45) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to parents’ educational qualification.

46) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to parents’ occupation.

47) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to parents’ income.

48) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to locality.

49) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to study habit.

50) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to the course on computer.

51) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to the experience in using computer.
52) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to participation in computer games.

53) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to chances for using internet.

54) To find-out the significance of difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to experience in using internet.

55) To find-out the relationship between the achievement in Mathematics and interest in Mathematics of the experimental group in the Post-test.

56) To find-out the relationship between the achievement in Mathematics and attitude towards computer of the experimental group in the Post-test.

57) To find-out the relationship between the achievement in Mathematics and attitude towards Mathematics of the experimental group in the Post-test.

1.18 Hypotheses of the study

The followings are the hypotheses framed for this study.

1) There is no significant difference between the Pre-test and Post-test mean scores of the achievement in Mathematics of the experimental group and the control group.

2) There is no significant difference between the Pre-test and Post-test mean scores of the interest in Mathematics of the experimental group and the control group.

3) There is no significant difference between the Pre-test and Post-test mean scores in attitude towards Computer of the experimental group and the control group.
4) There is no significant difference between the Pre-test and Post-test mean scores in attitude towards Mathematics of the experimental group and the control group.

5) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to sex.

6) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to parents' educational qualification.

7) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to parents' occupation.

8) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to parents' income.

9) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to locality.

10) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to study habit.

11) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to the course on computer.

12) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to the experience in using computer.
13) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to participation in computer games.

14) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to chances for using internet.

15) There is no significant difference between the Post-test mean scores of the achievement in Mathematics of the experimental group with respect to experience in using internet.

16) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to sex.

17) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to parents' educational qualification.

18) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to parents' occupation.

19) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to parents' income.

20) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to locality.

21) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to study habit.

22) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to the course on computer.
23) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to the experience in using computer.

24) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to participation in computer games.

25) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to chances for using internet.

26) There is no significant difference between the Post-test mean scores of the Interest in Mathematics of the experimental group with respect to experience in using internet.

27) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to sex.

28) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to parents' educational qualification.

29) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to parents' occupation.

30) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to parents' income.

31) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to locality.

32) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to study habit.
33) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to the course on computer.

34) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to the experience in using computer.

35) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to participation in computer games.

36) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to chances for using internet.

37) There is no significant difference between the Post-test mean scores of the attitude towards computer of the experimental group with respect to experience in using internet.

38) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to sex.

39) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to parents’ educational qualification.

40) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to parents’ occupation.

41) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to parents’ income.
42) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to locality.

43) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to study habit.

44) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to the course on computer.

45) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to the experience in using computer.

46) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to participation in computer games.

47) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to chances for using internet.

48) There is no significant difference between the Post-test mean scores of the attitude towards Mathematics of the experimental group with respect to experience in using internet.

49) There is no relationship between the achievement in Mathematics and interest in Mathematics of the experimental group in the Post-test.

50) There is no relationship between the achievement in Mathematics and attitude towards computer of the experimental group in the Post-test.

51) There is no relationship between the achievement in Mathematics and attitude towards Mathematics of the experimental group in the Post-test.
1.19 Limitations of the study

Owing to the constraint of time and money,

1) Only the high school level is taken for the study.

2) Only Tamil medium is taken for the study.

3) In Mathematics, at high school level though there are many units, only ‘Coordinate Geometry’ unit was considered for the present study.

4) Only some limited variables were assumed for the study.

5) Only Thanjavur Educational District is included for the study.

1.20 Organisation of the study

The study is concerned with the “A Study of the Effectiveness of e-Learning on pupils’ Achievement and Interest in Mathematics; Attitude towards Computer and Mathematics at High School Level” The various aspects of the study are presented in five chapters. The chapter-I deals with the introductory part of the thesis. Chapter-II enumerates the review of related literature. This deals materials related to Multimedia, Information technology, Achievement, Interest, Attitude, Computer and Mathematics found in India and abroad. The various techniques and methods involved in the conduct of the study are presented in Chapter-III. Chapter-IV deals with the analysis of the results and discussion. The summary and conclusion, suggestions and recommendations for further study are given in Chapter-V. The bibliography provides a list of books, journals, and reports which helped the researcher in conducting the research.