CHAPTER -2
CONCEPTUAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

2.1 CONCEPTUAL FRAMEWORK

2.1.1 INTRODUCTION

Conceptual framework is the structure of the content that the researcher is researching. It implies the researcher's understanding of the concept, the relevant information and other aspects of the content accumulated and created by the researcher for providing lucid content clarity.

2.1.2 EDUCATIONAL TECHNOLOGY

- **MEANING OF TECHNOLOGY**

The word technology comes from two Greek words, "techne" and "logos" which means craft, skill, art, or way, manner, or means by which a thing is gained. Another word, "technique" with the same origin, also may be used when considering the field Educational Technology. Technology can be most broadly defined as the entities, both material and immaterial created by the application of mental and physical efforts in order to achieve some value. In this usage, technology refers to tools and machines that may be used to solve real-world problems.

Definitions of Technology:

"Technology is the rational process of creation process of creating means to order and transform matter, energy, and information to realize certain valued ends".

The significance of this definition will become clearer below.

Technology is the set of means (tools, devices, system, method, procedures) created by the technology process. Technological objects range from toothbrushes to transportation systems.

Oxford Dictionary of Sociology, 2nd (1998) has given the definition of technology that is: "A term used rather loosely in sociology, to mean machines, equipment, and possibly the productive technique associated with them; or a type of social relationship dictated by the technical organization and mechanization of work…"

The information age brings wonderful opportunities and new challenges to the system of education. Technology provides educators with the opportunity to move from simply streamlining the way things have always been done to really imagining things they would like to do. In technology- rich classroom, students don't "learn" technology.

- **MEANING AND IMPORTANCE OF EDUCATIONAL TECHNOLOGY**

> **"***Educational technology is the considered implementation of appropriate tools, techniques, or processes that facilitate the application of senses, memory and cognition to enhance teaching practices and improve learning outcomes".*

In recent years much attention has been focused on the use of technology in classes. Identifying the value of technology in schools has challenged educational researchers for more than 20years. Part of the problem is our evolving understanding of how technology accentuates student learning. Raid changes in the technology itself also hamper research. Finally, the intertwining of complex variables in such a rich environment as a school precludes the pure isolation necessary to determine cause and effect. Rapid changes in technology have affected teaching-learning process deeply. The aim of improving educational Quality invites the question of to extent to which new technology aids this process. It is know that traditional formats are not always successful and efficient. New technologies offer opportunities for taking account of individual aptitude and interest. According to Jonassen, (1996) recent studies in the area indicate that effective use of education technology can help education system work better and more effectively. Use of technology in the classes gives students the chance of learning faster and more permanent. A significant increase was statistically found in the test scores of students in a computer aided learning environment. This shows the positive effect of technology for realizing

effective learning. The attitudes of teachers are important factors influencing use of education technology in classes.

According to Hardy,(1998) some researchers show that teachers do not have positive attitudes toward computers and moreover they have fear against computer use in the classroom. Many people warn of the possible harmful effects of using technology in the classroom. Will children lose their ability to relate to other human beings? Will they become dependent on technology to learn? Will they find inappropriate materials/ the same was probably said the invention of the printing press, radio, and television. All of these can be2q1` used inappropriately, but all of them have given humanity unbounded access to information which can be turned in to knowledge. Appropriately used interactively and with guidance they have become tools for the development of higher order thinking skills. Inappropriately used in the classroom technology can be used to perpetual old models of teaching and learning. Students can be plugged into computer to do drill and practice that is not so different from workbooks. Teacher can use multimedia technology to give more colorful, stimulating lectures. Both of these have their place. But such used does not begin to tap the power of these new tools.

In today's world teachers need to be equipped not only with subject-specific expertise and effective teaching methodology, but with the capacity to assist students to meet the demands of the emerging knowledge-based society. Teachers therefore require familiarity with new forms of information and communication technology and need to have the ability to use that technology to enhance the quality of teaching and learning. Educational Technology involves applying ideas from various resources to create the best learning environments possible for students.

Educational Technology helps teacher to perform his task in effective and efficient manner. It helps the teacher to find and develop new systems, processes and strategies to achieve educational objectives to its maximum level in effective and efficient manner. Educational Technology enables the teacher to male sensible and systematic use of computer, over head projector, LCD projector, slide projector etc. Educational Technology provides the scope of using principles and theories of psychology, the application of the technology and knowledge of other disciplines to enrich the teacher in the process of attainment of set goals. It helps the teacher in the development of cognitive, affective and Psycho-motor abilities of the learners.

- **DIGITAL TECHNOLOGIES**

For thousands of years, humans made presentations using only the tools they were born with: their voice and body. That was followed by tools such as chalkboards and projectors, and then by digital tools such as PowerPoint. More recently other tools have emerged, such as Sliderocket, Prezi, Glogster, Animoto, and Magic Magnify. Since the 1980's, the importance of computer support in the teaching and learning of mathematics has been emphasized more and more. Information and Communication Technology (ICT) is basically an umbrella term that encompasses all communication technologies such as internet, wireless networks, cell phones, satellite communications, digital television computer and network hardware and software; as well as the equipment and services associated with these technologies, such as videoconferencing, e-mail and blogs etc. that provide access to information. There are various types of technologies currently used in traditional classrooms. Among these are: Radio, television, audio tape, video tape, slide projector, overhead projector are of passive learning when interaction of the learner is less.

Computer in the classroom: Having a computer in the classroom is an asset to any teacher. With a computer in the classroom, teachers are able to demonstrate a new lesson, present new material, illustrate how to use new programs, and show new websites.

Class blogs and wikis: There are a variety of Web 2.0 tools that are currently being implemented in the classroom. Blogs allow for students to maintain a running dialogue, such as a journal, thoughts, ideas, and assignments that also provide for student comment and reflection. Wikis are more group focused to allow multiple members of the group to edit a single document and create a truly collaborative and carefully edited finished product.

Wireless classroom microphones: Noisy classrooms are a daily occurrence, and with the help of microphones, students are able to hear their teachers more clearly. Children learn better when they hear the teacher clearly.

Mobile devices: Mobile devices such as clickers or smart phone can be used to enhance the experience in the classroom by providing the possibility for professors to get feedback.

Interactive Whiteboards: An interactive whiteboard that provides touch control of computer applications. These enhance the experience in the classroom by showing anything that can be on a computer screen. This not only aids in visual learning, but it is interactive so the students can draw, write, or manipulate images on the interactive whiteboard.

Digital video-on-demand: Digital video eliminates the need for in-classroom hardware (players) and allows teachers and students to access video clips immediately by not utilizing the public Internet.

Online media: Streamed video websites can be utilized to enhance a classroom lesson.

Online study tools: Tools that motivate studying by making studying more fun or individualized for the student.

Digital Games: The field of educational games and serious games has been growing significantly over the last few years. The digital games are being provided as tools for the classroom and have a lot of positive feedback including higher motivation for students. There are many other tools being utilized depending on the local school board and funds available. These may include: digital cameras, video cameras, interactive whiteboard tools, document cameras, or LCD projectors.

- ## ROLE OF TECHNOLOGY IN EDUCATION

The Educational applications of technology was that interactive computer-based systems admit the possibility of individualizing the educational process to accommodated the needs, interests, proclivities, current knowledge, and learning styles of each particular students.

Technology can serve as a potentially powerful tool for teachers, who may use computer networks to:

1. Monitor, guide and assess the progress of their students.
2. Maintain portfolios of students work.
3. Prepare (both computer-based and conventional) materials for use in the classroom.
4. Communication with students and parents.
5. Exchange ideas, experiences, and curricular material with other teacher.

- **ROLE OF TEACHERS IN TECHNOLOGY**

1. In order to make effective use of Educational Technology, teachers will have to master a verity of powerful tools, redesign their lesson plan around technology enhanced resources.
2. Most teachers are left largely on their own as they struggle to integrate technology into their curriculum.
3. Most teachers report that computers initially make their job more difficult. Despite the daunting challenge of using computers and networks appropriately within an educational context.

- **POTENTIAL OF TECHNOLOGY IN DAILY LIFE**

Over the last few decades technology has become a very important tool in everyday life. Computers have become a common tool for communication, text processing, and many other activities, including different forms of media, audio, graphics, videos, and virtual reality. The development of internet and the increase in accessibility have opened a whole a new digital world. Children are not only exposed to new information and computer technology at school, but also at home. Many children today have computers at home and have access to internet. They use computers and technology everyday for entertainment, communication and education. Computer literacy is also an essential skill in occupational activities, since technology is widely used in business, economics and many other professions.

2.1.3 TRENDS IN EDUCATIONAL FIELD

Rapidly developing virtual education and distance learning methods are somewhat replacing and supplementing the classical education methods. The rapid growing visualization techniques are one of the important factors of these developments. With the help of visualization techniques we are able to create computer graphics thatdisplay data, particularly multidimensional scientific data, for human interpretation. This technology becomes today an integrated part in the education and used todevelop attractive presentations especially for three-dimensional cases, which thestudents have difficulties to understand.

- **COMPUTER IN EDUCATION**

In the ancient time men lived in jungle like animals. But to complete his requirements he started to think. And effort made men superior from animals. This was the straiten step in the history of progress. In this development process some inventions changed the life of men. These inventions were fire, wheel and electricity. These three inventions increased the speed of progress and made Human life much easier. Finally he found the computer which has machine which has changed the life of men and has become the machine this century.It is most significant contribution of man in the present century. The present era is era of science and computer is one out of them. It has wide applicability in the human life. It has made human life faster and precise.

- **VARIOUS TERMS USED FOR COMPUTER DELIVERED INSTRUCTION IN FORM OF PROGRAMME**

With the use of Computer in education a number of new terms are coined. They are mentioned as under:

COMPUTER	Assisted	Learning
	Aided	Instruction
	Based	Training
	Enriched	Testing
	Mediated	Evaluation
	Managed	Education

This contains CAI, CAL, CBI, CML, (CMI, CMT, CME). Moreover, Instructionaluse of Computers (IAC) and Administrative Applications of Computer (AAC) arealso used. In UK, the term Computer Aided Instruction is used whereas, in USA,Computer Assisted Instruction is used. However, both are interchangeable terms.

Computer Assisted Programme (**CAP**). Computer Assisted Programme a relatively newand rabidly evolving academic field of computer delivered. It explores the role ofinformation and communication technology in learning and teaching.

Computer Based Education (**CBE**) and Computer Based Instruction (CBI). These arethe broadest terms and can refer to virtually any kind of computer use in educationalsettings including drill and practice, tutorials, simulations, management,supplementary exercises, programming, database writing using word processors andother applications. These terms may refer either to stand alone computer learningactivities or to computer activities, which reinforce material introduced and taught byteachers.

Computer Managed Instruction (**CMI**). Computer Managed Instruction either to theuse of computers by school staff to organize student's data and make instructionaldecisions or activities in which the computer evaluates students test performance,guides them to appropriate instructional resources, or keeps record of their progress.

Computer Enriched Instruction (**CEI**). Computer Enriched Instruction as learningactivities in which computers (1) generate data at the students request to illustraterelationships in models of social or physical reality, (2) execute programmesdeveloped by the students, or (3) provide general enrichment unstructured exercisesdesigned to stimulate and motivate students.

The variation in terminology suggests the continual differentiation of computer aswell as the wide range of potential uses.

Now-a-days, computer has secured a significant place in almost every walks of lifeincluding education. As the demands of small class-room is emerging like ananything. It is but natural to include computers in the classroom transactions.Information technology and computer networks are becoming today an important partof the life. The computers and information technology are widely used to develop teaching possibilities. Although education is a complex process in which human and technical resources should be used very carefully, teaching and learning concept shave changed radically. Virtual education and distance learning methods will replacethe traditional education methods. Regarding this new concepts the education on all Disciplines needs evaluation and development. Visualization techniques are one of the important factors of these developments (ERIC, 2008).A teacher can deal with many different media i.e. print, audio, visual etc. Multimedia

presentation includes digital versions of all these traditional Medias, which can be combined, synchronized, and compared interactively.

The latest and biggest contribution of technology to the field of education is Computers. Computers are the new teachers that communicate messages worldwide through image and sound. The use of computers in education has grown from computer-aided instruction systems and then to micro worlds.The computer can be used as a tool in extending our mental capabilities. In this sense, it is different from the other tools but basically, its purpose is to make life simpler, easier and generally give up the freedom to use our time in activities of our choice. Further, it can be used in normal as well as handicapped and learning disabled classes Computers can never replace teachers. A teacher always plays a very important role in the teaching-learning process and computers will have to be used as teaching aids. Using quality educational software packages, good learning environments can be created in schools. Control free software packages, like a power point presentation, a data base programme, word processing programme, etc., will find extensive applications in the whole curricular area of schools.

REASON : TEACHER USE TECHNOLOGY IN HIS OR HER MATHEMATICS CLASSROOM.

Technology can reduce the effort devoted to tedious computations and increase students' focus on more important mathematics. Equally importantly, technology can represent mathematics in ways that help students understand concepts. In combination, these features can enable teachers to improve both ***how*** *and* ***what*** *students learn.*

TWO REASONS TO USE TECHNOLOGY : COMPUTATION AND REPRESENTATION

The use of technology has a long history in mathematics education. Many societies, for example, introduce arithmetic with an abacus, for two reasons. First, the abacus supports computation. Second, the abacus presents a tangible image of mathematics, which helps students understand difficult concepts.

Computation and representation go hand-in-hand, both historically and in the present. For example, in primary school classrooms, many teachers use concrete

manipulatives, such as Geoboards (allowing children to make geometric figures by stretching rubber bands over a grid of nails) or Dienes Blocks (providing children with a physical model of the place-value system in which "473" means four hundreds, seven tens and 3 ones). In secondary school, researchers have found that more advanced tools are necessary. These advanced tools help students learn by supporting computation and by giving abstract ideas a more tangible form. Researchers have found that whereas physical manipulatives are the right tangible form for elementary school, ICT-based tools are the right tangible form for secondary school (Kaput, 1992; Kaput 2007).

FOCUSING STUDENT THINKING

All people face limits in the number of levels or details they can keep track of during problem solving. In addition to the unavoidable difficulty of a particular math problem, learners may experience additional *cognitive load* (i.e., thinking difficulties) in the materials and tools they use. Teachers should minimize load that is unimportant to the current learning goal and direct student activity to thinking that is germane to what they should be learning (Sweller, 1988). Technology can be useful to the extent it focuses student thinking in ways that are germane, not extraneous. In primary school, it is important to learn to do arithmetic fluently. Using technology to do this thinking for the student would be inappropriate. In secondary school, however, students have mastered arithmetic and should be focused on more advanced skills and concepts. Computational support for lower-order details can then be very important.

- **SOFT WARE USED FOR TEACHING LEARNING MATHEMATICS**
  - Graphic Calculators
  - Dynamic graphing tools (Geo gebra)
  - Dynamic geometry tools
  - Microsoft Excel / spreadsheet
  - Microsoft Mathematics
  - Geo Gebra
  - Auto shape
  - Mat lab

2.1.4 MATHEMATICS

- **MEANING OF MATHEMATICS**

The definition of mathematics from Britannica concise encyclopaedia

“ *Science of structure, order, and relation that has evolved from counting, measuring and describingthe shapes of object. It deals with logical reasoning and quantitative calculations*”.

Aristotle defined mathematics as "***the science of quantity***", and this definition prevailed until the 18th century. Starting in the 19th century, when the study of mathematics increased in rigor and began to address abstract topics such as group theory and projective geometry, which have no clear-cut relation to quantity and measurement, mathematicians and philosophers began to propose a variety of new definitions. Some of these definitions emphasize the deductive character of much of mathematics, some emphasize its abstractness, some emphasize certain topics within mathematics. Today, no consensus on the definition of mathematics prevails, even among professionals.

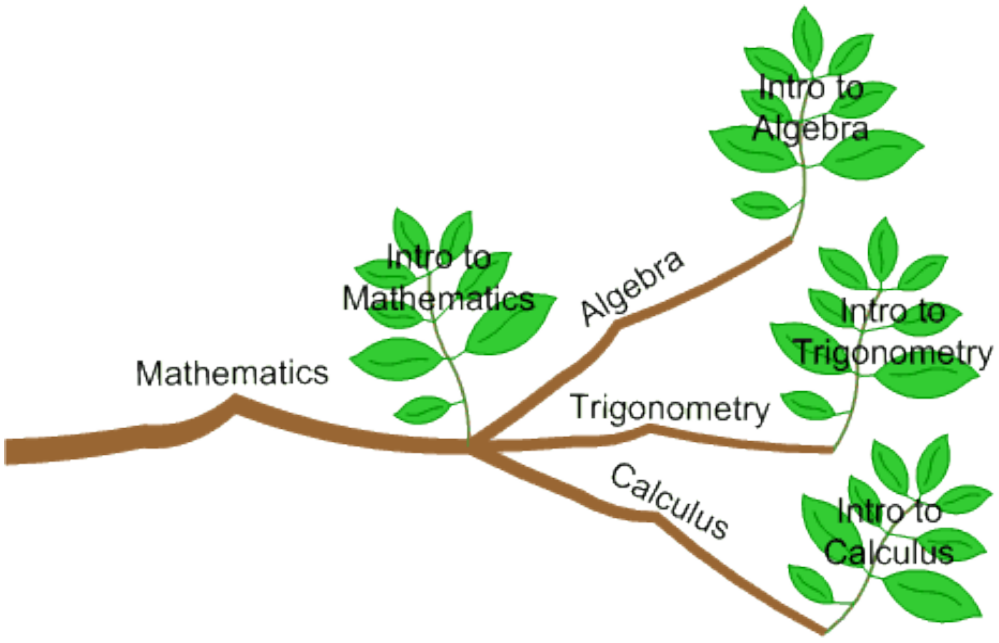
- **IMPORTANCE OF MATHEMATICS**

It is said that Mathematics is the gate and key of the Science. According to the famous Philosopher Kant, "*A Science is exact only in so far as it employs Mathematics*". So, all scientific education which does not commence with Mathematics is said to be defective at its foundation. Neglect of mathematics works injury to all knowledge.One who is ignorant of mathematics cannot know other things of the World. Again, what is worse, who are thus ignorant are unable to perceive their own ignorance and do not seek any remedy. So Kant says, "A natural Science is a Science in so far as it is mathematical". And Mathematics has played a very important role in building up modern Civilization by perfecting all Science.In this modern age of Science and Technology, emphasis is given on Science such as Physics, Chemistry, Biology, Medicine and Engineering. Mathematics, which is a Science by any criterion, also is an efficient and necessary tool being employed by all these Sciences. As a matter of

fact, all these Sciences progress only with the aid of Mathematics. So it is aptly remarked, "Mathematics is a Science of all Sciences and art of all arts."

Mathematics is a creation of human mind concerned chiefly with ideas, processes and reasoning. It is much more than Arithmetic, more than Algebra more than Geometry. Also it is much more than Trigonometry, Statistics, and Calculus.Mathematics includes all of them. Primarily mathematics is a way of thinking, a way of organizing a logical proof. As a way reasoning, it gives an insight into the power of human mind, so this forms a very valuable discipline of teaching-learning programmed of school subjects everywhere in the world of curious children. So the pedagogy of Mathematics should very carefully be built in different levels of school education.In the pedagogical study of mathematics we mainly concern ourselves with two things; the manner in which the subject matter is arranged or the method the way in which it is presented to the pupils or the mode of presentation. Mathematics is intimately connected with everyday life and necessary to successful conduct of affairs. It is an instrument of education found to be in conformity with the needs of human mind.Teaching of mathematics has its aims and objectives to be incorporated in the school curricula. If and when Mathematics is removed, the back-bone of our material civilization would collapse. So is the importance of Mathematics and its pedagogic.

- **BRANCHES OF MATHEMATICS**



Mathematics, deductive study of numbers, geometry, and various abstract constructs, or structures; the latter often "abstract" the features common to several models derived from the empirical, or applied, sciences, although many emerge from purely mathematical or logical considerations. Mathematics is very broadly divided into foundations, algebra, analysis, geometry, and applied mathematics, which includes theoretical computer science.

A] ALGEBRA

Historically, algebra is the study of solutions of one or several algebraic equations, involving the polynomial functions of one or several variables. The case where all the polynomials have degree one (systems of linear equations) leads to linear algebra. The case of a single equation, in which one studies the roots of one polynomial, leads to field theory and to the so-called Galois theory. The general case of several equations of high degree leads to algebraic geometry, so named because the sets of solutions of such systems are often studied by geometric methods.

Modern algebraists have increasingly abstracted and axiomatized the structures and patterns of argument encountered not only in the theory of equations, but in mathematics generally. Examples of these structures include groups (first witnessed in relation to symmetry properties of the roots of a polynomial and now ubiquitous throughout mathematics), rings (of which the integers, or whole numbers, constitute a basic example), and fields (of which the rational, real, and complex numbers are examples). Some of the concepts of modern algebra have found their way into elementary mathematics education in the so-called new mathematics.

Some important abstractions recently introduced in algebra are the notions of category and function, which grew out of so-called homological algebra. Arithmetic and number theory, which are concerned with special properties of the integers—e.g., unique factorization, primes, equations with integer coefficients (Diophantine equations), and congruence—are also a part of algebra. Analytic number theory, however, also applies the non- algebraic methods of analysis to such problems.

B] ANALYSIS

The essential ingredient of analysis is the use of infinite processes, involving passage to a limit. For example, the area of a circle may be computed as the limiting value of the areas of inscribed regular polygons as the number of sides of the polygons increases indefinitely. The basic branch of analysis is the calculus. The general problem of measuring lengths, areas, volumes, and other quantities as limits by means of approximating polygonal figures leads to the integral calculus. The differential calculus arises similarly from the problem of finding the tangent line to a curve at a point. Other branches of analysis result from the application of the concepts and methods of the calculus to various mathematical entities. For example, vector analysis is the calculus of functions whose variables are vectors. Here various types of derivatives and integrals may be introduced. They lead, among other things, to the theory of differential and integral equations, in which the unknowns are functions rather than numbers, as in algebraic equations. Differential equations are often the most natural way in which to express the laws governing the behavior of various physical systems. Calculus is one of the most powerful and supple tools of mathematics. Its applications, both in pure mathematics and in virtually every scientific domain, are manifold.

C] GEOMETRY

The shape, size, and other properties of figures and the nature of space are in the province of geometry. Euclidean geometry is concerned with the axiomatic study of polygons, conic sections, spheres, polyhedral, and related geometric objects in two and three dimensions—in particular, with the relations of congruence and of similarity between such objects. The unsuccessful attempt to prove the "parallel postulate" from the other axioms of Euclid led in the 19^{th} century the discovery of two different types of non-Euclidean geometry.

The 20^{th}century, has seen an enormous development of topology, which is the study of very general geometric objects, called topological spaces, with respect to relations that are much weaker than congruence and similarity. Other branches of geometry include algebraic geometry and differential geometry, in which the methods of

analysis are brought to bear on geometric problems. These fields are now in a vigorous state of development.

- ## SOLID GEOMETRY

In mathematics, **solid geometry** was the traditional name for the geometry of three-dimensional Euclidean space. **Stereometry** deals with the measurements of volumes of various solid figures including pyramids, cylinders, cones, truncated cones, spheres, and prisms.

The Pythagoreans dealt with the regular solids, but the pyramid, prism, cone and cylinder were not studied until the Platonists. Eudoxus established their measurement, proving the pyramid and cone to have one-third the volume of a prism and cylinder on the same base and of the same height, and was probably the discoverer of a proof that the volume of a sphere is proportional to the cube of its radius.

Even those suffering from math-related anxieties or phobias cannot escape its everyday presence in their lives. From home to school to work and places in-between, math is everywhere. Whether using measurements in a recipe, or deciding if half a tank of gas will make the destination, we all use math. It is a good idea, therefore, for teachers and parents of reluctant math learners to use real world examples to ignite a spark of practical interest.

- ## USES OF MATHEMATICS IN OUR DAILY LIFE

Mathematics is defined as the science which deals with logic of shape, quantity and arrangement. During ancient times in Egypt, the Egyptians used mathematics and complex mathematic equations like geometry and algebra. That is how they managed to build the pyramids.

During the 16^{th} century symbols associated with mathematics were officially invented, so before this invention, all equations were written out in full. However, the actual minus and plus symbols had been around even before that invention.

Our day today life would be quite strenuous without mathematics knowledge. There are many ways in which people use mathematics during the day today living. Below are some ways in which people use mathematics in daily lives.

- Daily life would be very difficult without mathematics' knowledge at all. To begin with, you need to be able to organize and count your money; as well as subtract, divide and multiply. This is a skill everyone needs to have in order to survive. Every day we visit supermarkets to buy items, without mathematics knowledge, we would not be able to know if we have been given the right change.
- Some DIY jobs require basic mathematics knowledge for them to be done effectively. For example, a person needs to work out the amount of materials required in order to decorate a house. One has to be aware of the measurement, space and shape of the area he is working on to ensure that he or she has purchased the required amount of materials. This helps in ensuring that you do not run out of essential materials before the job is finished or you do not have too much left over.
- In the field of architecture or engineering, it is essential to have more advance mathematics knowledge. Working on geometry and algebra helps in reasoning skills and assist later in life to solve technical problems. Several other jobs also require workers to apply mathematics, such as building and construction, scientist, plumber, electrician, accountant and even rally drivers.
- Jobs which do not use mathematics every day still require some basic knowledge of mathematics to complete certain tasks. Some people might be against this, but it is advisable for everyone to learn basic mathematic skills.
- Whether you believe this or not, sports do rely greatly on mathematics. Managers, players and even supporters ought to have some basic mathematics owl edge. The mathematics concept can apply when one wants to comment about the game, the player's analysis and much more. Referees and coaches make calls which are based on time, statistics and percentage – all the past game played and players, their failure and success rates can only be worked out using some aspects of mathematics.

Their are some other ***Uses of Mathematics are as follow:***

1] At Home: Some people aren't even out of bed before encountering math. Setting an alarm and hitting snooze, they may quickly need to calculate the new time they

will arise. Or they might step on a bathroom scale and decide that they'll skip those extra calories at lunch. People on medication need to understand different dosages, whether in grams or millilitres. Recipes call for ounces and cups and teaspoons --all measurements, all maths. And decorators need to know that the dimensions of their furnishings and rugs will match the area of their rooms.

2] In Travel: Travellers' often consider their miles-per-gallon when feeling up for daily trips, but they might need to calculate anew when faced with obstructionist detours and consider the cost in miles, time and money. Air travellers need to know departure times and arrival schedules. They also need to know the weight of their luggage unless they want to risk some hefty baggage surcharges. Once on board, they might enjoy some common aviation-related math such as speed, altitude and flying time.

3] At School and Work: Students can't avoid math -- most take it every day. However, even in history and English classes they may need to know a little math. Whether looking at time expanses of decades, centuries or eras or calculating how they'll bring that B in English to an A, they'll need some basic math skills. Jobs in business and finance may require sophisticated knowledge of how to read profit and earning statements or how to decipher graph analyses. However, even hourly earners will need to know if their working hours times their rate of pay accurately reflects their pay checks.

4] At the Store: Whether buying coffee or a car, basic principles of math are in play. Purchasing decisions require some understanding of budgets and the cost and affordability of items from groceries to houses. Short-term decisions may mean only needing to know cash-at-hand, but bigger purchases may require knowledge of interest rates and amortization charts. Finding a mortgage may be much different than choosing a place to have lunch, but they both cost money and require math.

- ## GOALS OF TEACHING MATHEMATICS

The process of education can be kept on right lines only with the help of clear-cut aims. Aimlessness in teaching would result in the wastage of time, energy and other resources.

According to Kulbir Singh Sidhu-

"*Knowledge of educational values helps the teacher to avoid aimlessness in teaching. Value is the spring board of aim* and vice-versa."

There are three main values of mathematics, Practical or utilitarian value, Disciplinary value, Cultural value. Aim will be based on the educational values of the subject. One can prepare a long list of goals of teaching mathematics. These aims pertain to the entire school stage. Apart from enabling the student to acquire essential mathematical knowledge, skills, interests and attitude, the teaching of mathematics has to help them in many ways. Aims of teaching mathematics are as follows-

Utilitarian aim: Mathematics will be taught primarily for its practical values and aims. The students 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 and establishes relation between the subject and practical life.

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.

Cultural aim: This aim helps the learner to understand the contribution of mathematics in thedevelopment of civilization and cultural. It has enabled him to understand the role of mathematics in fine arts and in beautifying human life.

Adjustment aim: It is help the learner to develop a healthy, purposeful, productive, exploratory andcontrolling adjustment with environment.

Social aim: It is to help the learner to imbibe essential social virtues.

Moral aim: It enables the learners to imbibe the attribute of morality.

Aesthetic aim: It is to develop their aesthetic sensibilities, meet their varying interest and help them in the proper utilization of their leisure time.

International aim: To develop in them international outlook and understanding.

Vocational aim: It is to prepare them for technical and other vocations where mathematics is applied.

Inter-disciplinary aim: To give them insight into the application of mathematics in other subjects.

Self-education aim: It is to help them to become independent in learning.

Educational preparation aim: It is to prepare them for higher education in science, engineering, technology, etc.

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

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.

2.2 REVIEW OF RELATED LITERATURE

Researcher had discussed the statement of the problem, objectives, hypotheses, importance of the study and limitations of the study. But in order to understand the present research work and for its successful planning, it is necessary to study the related literature as it makes the research work more meaningful, successful and useful. It is but natural that the researcher should study the related literature before they carry out their research work. A review of the work done in the areas related to the present research has been presented in this chapter.

2.2.1 IMPORTANCE OF RELATED LITERATURE

The review of the related literature is an importance requirement of actual planning on the bases of which the execution of any research work can be done. The review of related literature becomes a friend, philosopher and guide for the researchers.

Research worker should study the research literature as a step in identifying & pinning down a good problem. The search for a reference material is a time consuming but very fruitful phase of research program. It helps the researcher to avoid useless repetition in their research work. Every researcher must know what sources are available in the field of study, which of them, researcher is likely to use & where & how to find them. In short, it enables the researcher to get insight into the problem on hand. The study of related literature also gives an idea about the different

approaches, methods, tools and equipments, selection of samples, statistical techniques, evaluation and measurement of the research work already done and major findings of the previous research work. Thus, the review of related literature provides some insight regarding strong points and limitations of the previous studies. In enables the researcher to improve their own research work. The review are the Bible for the researcher. It guides the researcher in their study. Its main objectives are as below:

(1) To gather general information from the past reviews on the Computer Assisted Programme to teach Mathematics.
(2) The researcher feels ease and clear in taking decision for the present study from the past research.
(3) The researchers can find the untouched areas for the further study, which will direct the researcher in the study.
(4) The lists of the reference books help the researcher to get success.
(5) To decide proper hypotheses, objectives, methodology of the research.

Moreover, the researcher comes to know about the delimitations of the previous studies. In other words, review of related literatures work as a lighthouse for the researchers. Hence, the researcher has made a humble attempt to present the review of related literature in two parts.

(1) Review of related studies conducted in Mathematics.
(2) Review of related studies conducted in other Subjects.

2.2.2 STUDIES CONDUCTED IN THE FIELD OF MATHEMATICS

Educational technology brings super power in the field of Education which is very precious of the research used by various department of Mathematics. Here the researcher is going to give the history of the past research work conducted:

Vyas C.S., (1983), conducted a study on "Development of Symbol Picture LogicProgramme and to Study its Effect on Mathematics Achievement-A System Approach". The objectives of the study were (i) to develop a symbol picture logic programme (SPLP) on the basis of the fundamentals of symbolic logic, (ii) to study

the effectiveness of the SPLP on the achievement in mathematics, (iii) to identify the effect of the SPLP in the context of variables like intelligence and syllogistic reasoning ability, and (iv) to find the effectiveness of the SPLP in the context of other variables like parent education, sex and the choice of mathematics course at the S.S.C. level. There were 160 students in the experimental group and 160 in the control group. Fourschools were selected at random from 16 schools of Bayadtaluka. The tools were (i) Entering behaviour test in mathematics (ii) Desai- Bhatt group test of intelligence (iii)Symbol – Picture logic test (iv) Syllogistic reasoning test (v) Syllogistic reasoning test inmathematics.The symbol picture logic programme was developed keeping in mind the basicelement of logic to be included in set programme and the basic connectives in logic. Forselecting the basic connectives; in symbol picture logic, the concept of Linda Jestrom of the Centre for Research in Thinking and Language of Catholic University was kept in mind.The equivalent group technique was adopted. The 2 X 2 X 2 factorial design was adopted for studying the SPLP in relation to achievement, parents' education and sex. Analysis of variance technique was used for analyzing the data. The experiment was carried out on students of class IX. Some of the findings were: (1) The students of the experimental group who were givena treatment of the SPLP showed better achievement in mathematics than the control groupstudents. (2) The students with high intelligence benefited more by the SPLP by better achievement in mathematics than those who possessed low intelligence. (3) The student possessing high reasoning ability benefited more by the SPLP by better achievement in mathematics than those who possessed low reasoning ability. (4) There was no interaction between the programme (treatment) and intelligence. (5) There was no interaction between the programme and syllogistic reasoning ability. (6) There was no interaction effect of intelligence and syllogistic reasoning ability of the students. (7) There was no inter action among the programme, intelligence and syllogistic reasoning ability. This showed that the achievement in mathematics was independent of these three variables. (8) The student’s ofthe control group possessing low general ability.

Kothari R. G. (1985), conducted a study on "An Investigation into Efficiency of Different Instructional Media in the Teaching of Mathematics to the Pupils of Class IX in Relation to Certain Variables". The objectives of the study were (i) to investigate the efficacy of instructional mediaI (visual projection) over instructional media II (activities and experiment) in terms ofachievement, (ii) to investigate the efficacy of visual projection over programmed learning material, (iii) to investigate the efficacy of activities and experiments over programmed learning material, (iv) to investigate the efficacy of visual projection over the traditional method of teaching, (v) to investigate the efficacy of activities and experiments over the traditional method of teaching, and (vi) to investigate the efficacy of programmed learning material over the traditional method of teaching in terms of achievement.The experiment was carried out in two schools. Four groups of class IX pupils having 30 pupils in each group were selected for implementing the instructional media while theother four groups were treated as control groups. The tools are (i) The Junior Index of Motivation (JIM Scale) (ii) Test of Reasoning Ability were usedfor collecting necessary information about the variables. The procedure for analysis were: Factorization of the type $a^2 - b^2$ and expansion of $(a + b)^2$ were selected for preparing transparencies for projection through the overhead projector. The same topic was selectedfor the preparation of materials for activities and experiments as well as for preparing programmed learning material. The criterion tests on both units were prepared. The pre-test post-test control group design was adopted for the purpose of studying the efficacy ofdifferent media. The analysis of covariance was used to draw conclusions.Some of the major findings of the study were: (1) Visual projection and activities and experiment were equally effective for Unit I while visual projection was superior to theactivities and experiment approach for Unit II. (2) Visual projection was superior toprogrammed learning material for Unit I, while they were equally effective for Unit II. (3)The approach of media activities and experiment was superior to programmed learning material for Unit I but they were equally effective for Unit II. (4) Visual projection was superior to the traditional method of teaching for Units I and II. (5) The activities and experiment approach and the traditional method were equally effective for both units. (6) Programmed learning material and the traditional method of teaching were equally effectivefor Units I and II. (7) The results clearly indicated that the instructional media I, namely visual projection, was comparatively more effective than any other media like activities and experiment or even programmed

learning material. The low achievers were comparatively more benefited by programmed learning material than the high and average achievers.

Vora G.C. (1985), conducted a study on "An investigation into the impact of Divergent thinking Programme in Mathematics on the creative levels of the children of classes VII and VIII". The objectives of the study are (i) To provide the reliable divergent thinking programme in mathematics.(ii) Tostudy the effect of Divergent Thinking Programme in mathematics on the creativity ofstudents of standard VII and VIII with respect to reinforcement. i.e. feed back. (iii) Tostudy the effect of DTPM on the creativity components viz. Fluency, Flexibility and Originality. (iv) To investigate whether the grade difference in creativity is there or not. (v)To investigate whether the sex difference in the creativity exists or not. The samples were comprised only one school complex with co-education system in Gujarati medium was chosen for the experiment. Three classes of standard VII and VIII from a school in Ahmadabad city were selected. Then three equal groups of each standard were formed (a control group and two experiment groups) One experimental group was formed as a group with feedback and other experimental group called group without feedback. Thus, there were four experimental groups with 90 students in all.Main tools were used in this study were PTC and DTPM (i) Passi Test of Creativity(PTC). PTC contained six tests, four test were verbal and remaining non verbal. In this study the verbal tests were used. (ii) Divergent thinking Programme in mathematics. The DTPM tool was prepared and tested as an instrument for creativity. It contains three types ofproblems (a) Multi- response (b) Hidden shapes (c) Make-up problems.Analysis of pre-test score post-test score was made for all the six groups. The ANCOVA method was applied. Various finding were considered together and discussed objectives were narrated with reference to the hypothesis, observation and conclusion. (1) Divergent Thinking Programme in mathematics was an essential tool to develop creativity of VII and VIII grade students. (2) The programme was equally useful to develop creativity in ether sex. (3)DTPM was an essential tool to increase in fluency a creativity component of the students ofboth the standard (4) DTPM was not useful to get change in flexibility scores. (5) DTPMwas useful but the training was not effective for originality.On the whole, the results derived from the analysis were very interesting and encouraging,and they showed that creativity can be developing through DTPM.

Chitkara M. (1985), conducted a study on "To study the effectiveness of Different strategies of teaching on achievement in mathematics in relation to intelligence, sex and personality". The objectives of the study were to find out (i) whether achievement in mathematics was affected by different strategies of teaching, (ii) whether different strategies had differential effects onachievement of male and female students, (iii) whether levels of intelligence interacted with teaching strategies in terms of achievement, and (iv) whether personality acted as a potential factor inselection of teaching strategy.A sample of 300 students was randomly selected from grade IX students of four schools of Chandigarh. The sample subjects were administered (i) The Mathematics Achievement Test, (ii)The Jalota Group Test of Mental Ability (1972), (iii) The Eysenck Personality Inventory(1964).In the study a pre-test/post-test experimental design, was followed. A four-way factorialdesign (3 X 2 X 2 X 3) was employed. The independent variables in the study included strategies ofteaching, sex, personality and intelligence and the criterion variable was achievement inmathematics. Toe strategies of teaching varied in three ways-(a) lecture-discussion, (b) inductivedrilland (c) auto- instruction group discussion. The personality varied in two ways- extraverts and introverts; the variable of intelligence had three levels-low, average and above average. The studentswere divided into three groups of 100 each. One group was taught mathematics through lecture discussion, the second group was taught mathematics through inductive-drill and the third group was taught mathematics through auto-instruction group discussion. The data collected through pre-test/post-test were analyzed through four way (3 X 2 X 2 X 3) analysis of variance. The findings of the study were: (1) All the three strategies, namely, (a) lecture-discussion, (b)inductive-drill, and (c) auto- instruction group discussion, were found to be equally effective interms of achievement in mathematics disregarding levels of intelligence, sex and personality type.(2) Boys and girls of superior ability did not show any significant difference between their mean scores on achievement in mathematics. (3) Girls of average ability scored significantly higher in mathematics than boys of average ability. (4) Lecture discussion strategy found favour with average ability students as they scored significantly higher than above- average and below-average groups.(5) Strategy II and strategy III, namely inductive-drill and auto-instruction group discussion, wasmore suited to the students having above-average intelligence than average and below-average intelligence. (6) The strategy of lecture-discussion was found to be equally effective with above average and below-average

ability (intelligence) introverts as well as extraverts. (7) Extraverts ofhigh ability, average ability and below-average ability scored equally well when taught through strategy I. (8) under the strategy of inductive-drill, average-ability extraverts scored significantly higher than average-ability introverts. (9) Under the strategy of auto-instruction group discussion,high ability and low ability extraverts did not differ from the high ability and low ability introverts.But extraverts of average ability differed significantly in their achievement from average ability introverts. (10) Out of the three strategies, strategy I was more suited for below-average ability extraverts and introverts, strategy II for high ability extraverts and strategy III was most suited forhigh ability introverts for achievement in mathematics.

Nagar,N.(1988) conducted a study on "Effectiveness of Computers in Teaching Mathematics in schools" The study attempts to ascertain how best a teacher can use the computer to improve learning in the classroom.The Objectives of the study (i) To examine the usefulness of the computer in teaching Mathematics, (ii) to examineareas/aspects of Mathematics which can be more effectively taught with the help of computers, and (iii) to examine the trends regarding the use of computer-aided teaching of Mathematics. The Methodology of the study is based on a survey of studies, which include, mainly, three projects and ten research studies conducted independently. The Major Findings of the study (1) Computer Assisted Teaching (CAT) of Mathematics benefited both the teacher and the learner. (2) CAT encouraged individualization and practice without burdening the teacher with repetitive and monotonous activity. (3) CAT helped the learners to use their creativity by exploring new areas not covered by the syllabus. (4) Computer awareness was not sufficient in schools for CAT. (5) In India, we have gone in for the theoretical rather than the practical aspects of computer based education. Project CLASS was not able to reach the child especially. (6) There were not enough computers in schools, and not enough awareness regarding the computer. The computers that were available were not being put to the best possible use. Teachers had a great mistrust of the computers and perceived it as an inconvenience rather than as an aid. Their negative attitude was agreat hindrance in popularizing the use of computer literacy in the educational system, especially at the secondary level of education.

Singh, R. D., Ahluwalia, S. P. & Verma, S. K. (1991), conducted a study on "Teaching of Mathematics: Effectiveness of Computer Assisted Instruction (CAI) & Conventional Method of Instruction". The study centres upon the problem of the effectiveness of Computer Assisted Instruction & conventional method of instruction in teaching Mathematics, in terms of achievement of Mathematics and direction of change in attitude towards Mathematics of male and female students.The objectives of the study were: (i) To study the difference in Mathematics achievement which occurs as a result of the difference in instructional strategy among boys and girls separately and as a group and (ii) to study the direction of change in attitudes of male and female students separately and as a group towards Mathematics as a result of two different instructional strategies.The sample of the study consisted of 220 students from four selected higher secondary schools, covering the good, average and poor schools of the Bhilai Steel Plant, Bhilai (M.P.)The findings of the study were (i) The students who used the computer scored significantly higher than those taught Mathematics through the conventional method. (ii) The students who used the computer showed significantly highly favourable attitude towards Mathematics than those who did not use the computer. (iii) Achievement in Mathematics and change in attitude towards Mathematics were foundto be independent of the sex factor.

Singh, R.D. (1992), conducted a study on "Effectiveness of teaching Mathematics through Computer Assisted Instruction & Conventional Method of instruction on cognitive and non-cognitive variables". Singh conducted a research on Effectiveness of teaching Mathematics through Computer Assisted Instruction & conventional method of instruction on cognitive and non-cognitive variables from Guru Ghasidas University as a part of Ph.D. degree.Singh has discussed the relative merits of teaching Mathematics through Computer Assisted Instruction and conventional methods of teaching. Computer Assisted Instruction was always found superior, but the gains were more in the case of good students and there was a definite positive change of attitude towards learning Mathematics on the part of both boys and girls due to use of the computers.

Jothikani, N. and Thiagarajan, A. P. (2004), conducted a study on "Effectiveness of Computer Assisted Instruction in Mathematics among B.Sc., Degree students". The objectives are (i) To analyse the efficiency of teaching Mathematics among B.Sc., Degree students through CAI over conventional method for knowledge, comprehension and application objectives; (ii) to compare the effectiveness of teaching Mathematics through CAI to B.Sc. Degree (Mathematics) students over conventional method in terms of the levels of achievement; and (iii) to study the effectiveness of teaching Mathematics through CAI to B.Sc.,Degree (Mathematics) students over conventional method in terms of objectives of teaching Mathematics and their level of achievement.Two equivalent groups each in I year, II year & III year of Mathematics students were formed based on their achievement score in the previous year. The investigator taught the control groups andthe experimental groups were taught through CAL t-test was applied in order to test significant ofthe difference between the mean scores of pre-test and post-test of conventional and experimental group & to test the significant of CAI over conventional method for the mean gain scores of control & experimental groups. The major findings are (i) There is no significant difference between the mean scores of pre-test for control andexperimental group in all six units with reference to the objective such as Knowledge, Comprehension & Application and their level of achievement such as Low, Average and High Achievers. (2) The mean scores of post-test of control group are significantly higher than of the experimental group in all six units with reference to the objective & their level of achievement inboth the years 1999-2000 & 2001-2002. (3) The mean gain scores of the control group are significantly greater than that of experimental group in all six units with reference to the objective &their level of achievement in both the years 1999-2000 &2001-2002. Hence, it is concluded that the conventional method is more effective & efficient than CAI method.

Ash J. E. (2005), conducted a study on "The effects of Computer Assisted Instruction on middle school Mathematics achievement". Success in Mathematics is central to a good education in the modern world. The better educateda society the more successful the society. The United States is behind the world in Mathematics education and must do everything to develop effective pedagogies for its instructions.Proponents of computer technology in education argue that it makes

learning easier, more efficient, and more motivating (Schacter & Fagnano, 1999). Skeptics argue that there is a lack of experimental data obtained under rigorous scientific standards. Computer Assisted Instruction (CAI)is an educational medium in which a computer delivers instructional content or activities. Many studies have been completed attempting to determine the effects of Computer Assisted Instructionon academic achievement. Frank Brown (2000) found a 17% increase in achievement in Mathematics during a study in North Carolina. A recent study by Traynor (2003) found that utilizing Computer Assisted Instruction improved instruction over only using traditional methods. Traynor found a significant increase in academic achievement.For this study, a cause-effect linkage was suspected between the use of Computer Assisted Instruction software and achievement in Mathematics. A study was required to prove or disprove this relationship in which one can manipulate the variable of Computer Assisted Instruction. Aquasi-experimental study was used with a two-group, pre-test post-test design. The control groupwas taught by traditionally accepted teaching methods throughout the study. The experimental group received the same traditional teaching methods plus one hour a week of Computer Assisted Instruction in the form of Orchard software. The differences between the scores on the post-test andpre-test were calculated and the means of the differences from the experimental group and thecontrol group were compared using a t-test. The results of the data analysis indicated that the use of Computer Assisted Instruction in addition to traditional teaching methods is more effective than Traditional teaching methods alone. No difference was found between the genders of the subjects in the change of their academic achievement as measured by the difference from the pre-test to the post-test.

Chen Chiu-Jung. (2005), conducted a study on "Learning Mathematics problem solving through personalized Computer Assisted Program in Taiwan". The study evaluated the effects of a personalized Computer Assisted Mathematics problem solving program on the performance and attitude of fourth grade Taiwanese students. The purpose ofthe study was to determine whether the personalized Computer Assisted program in Mathematics word problems improves student performance and attitude over the non-personalized program. Atotal of 165 Taiwanese fourth-grade students participated in the study. The research used the pre-testto post-test to

determine if the CAP was effective between the two groups.The problem solving exam was based on Mathematics word problems.All of the subjects were randomly assigned to a personalized or non-personalized group. In the personalized group, students completed a survey asking them what their favourite classes, fruits,sports and supermarkets were. Their references were then used to create personalized Mathematics group, students took the same survey as the personalized group, but were taught the sameMathematics using a standard lesson in the Computer Assisted program. Both groups used theComputer Assisted program for the pre-test, the Mathematics word problem lessons, and post-test.There were four types of Mathematics word problems: multiply-multiply, multiply-divide, divide multiplyand divide-divide. After completing all the tests related to the Computer Assisted program,all students completed a student attitude survey through Computer Assisted program. The CAP used in the research was Chinese version and was edited by the author of thispaper. The English version was created by Dr. Ku in University of Northern Colorado.The results of the study showed that the personalized Computer Assisted program onMathematics word problems improved student performance and attitude. The achievement ofstudents in the personalized group was significantly higher than those in the non-personalized group.The post-test score of the personalized group was significantly higher than post-test score of then on personalized group. There is no specific gender difference in the pre-test and post-test scores between the personalized group and the non-personalized group. The attitude of students in the personalized group was significantly more positive than those in the non-personalized group.

2.2.3 REVIEW OF RELATED STUDIES CONDUCTED IN OTHER SUBJECTS

Basu, M.K. (1981), conducted a study on "Effectiveness of Multimedia Programmed Materials in the Teaching of Physics". The main purpose of the study was to make an appraisal of the relative effectiveness of multimedia programmed instruction and programmed class-teaching on the criteria of immediate achievement and retention of a group of subjects at three levels of ability. The specific objective of the study were (i) to develop instructional materials for the strategyof programmed

class-teaching and to study its effectiveness, (ii) to develop the programmed learning materials on Light in school physics in four different styles – semi – programme, linear Programme,branching programme and hybrid programme. (iii) To develop a multimedia programme in conjunction with audio-visual media. (iv) To compare the relative effectiveness of different strategies of instruction employing multimedia programmed material and programmed classteaching on the criteria of immediate achievement, retention and delayed retention and (v) To studythe interaction effects of instrumental effects of instrumental strategies, abilities and occasions(immediate learning, retention and delayed retention).The sample consisted of 400 learners of standard IX which comprised an equal number of boysand girls.The tools used were A group Test of Intelligence B.E.P.R.T. in Bengali, the Entry level Testsand criterion referenced Tests I, II, III, Five Treatment groups taken.The experiment was performed in schools for a pretty long time in three phases, from March1979 to December 1979. The experimental data were analyzed by analysis of covariance and by5×3×3 factorial experiment with nesting and crossing. The following were the findings of the study: (i) there was a significant difference among thedifferent strategy means on the criterion on overall achievement. It was found that on the criterion ofoverall achievement the multimedia semi-programmed instruction was better than the strategy ofprogrammed teaching; the multimedia linear programmed instruction was better than the multimedia semi-programmed instruction; the multimedia branching programmed instruction was better than the multimedia linear programmed instruction; and the multimedia hybrid programmed instruction wasbetter than the multimedia branching programmed instruction. (2) The strategies of multimedia programmed instruction enabled learners to reach the level of mastery learning (mean score variedbetween 80.00 and 86.00 out of 100). (3) It was found that a significant difference existed in the achievement through the different strategies due to differences in ability.

Joshi C.L. (1992), conducted a study on "The Construction and Try out of Networks for some topics of Physics for Standard XII Science stream". The objectives of the study were (i) To increase the level of understanding of the pupil of higher secondary classes of standard XII science stream in the different topics of 'Physics' which are to be taught by using 'network' diagrams. (ii) To evaluate the

effectiveness ofthe teaching using network diagrams compared to the teaching through the traditional method. Pupils were divided into two groups. They are constituted with the high achievers and low achievers group. These pupils are taught the different possible topics with the network diagram. The sample constituted of pupils of XII science. Pre-post test were administrated on the pupils. The major findings were (i) From the results obtained there is a significant difference on mean achievement post test scores of pupils belonging to group A and group B. (ii) There is no significant difference on mean of post test scores of pupils of high achievers of group Aand high achievers of group B. (iii) No significant difference on mean post test scores ofpupils belonging to the high achievers of group A and pupils belonging to low achieversof group B. (iv) Significant difference is obtained on mean post test scores of pupils belonging to the high achievers of group B and pupils belonging to the low achievers ofgroup A.

Rose, A.V. (1992), conducted a study on "Effectiveness of the Computer Assisted Instruction with special reference to underachievers". The study throws light on the application of Computer Assisted Instruction (CAI) and the Teacher Support System (TSS) for the optimum development of underachievers (UA). The objectives of the study were: (i) To develop CAI software (ii) To find out the effectiveness of CAI with TSS and CAI with reference to the learner variable viz. sex, locale, IQ and achievement level and (iii) To find out the interaction of the learner variables and the treatment on the achievement score. The method used was to randomized block design was followed in the selection of the sample, with IQ as the blocking variable. The sample consisted of three group of size 32 each composed of students of standard IX selected from three Tamilnadu State Board Schools covering one rural ad two urban. The underachievers in the sample were identified by using the regression analysis. The tools used included CAI software on "the language of sets", achievement Test, Cultural Fair, Intelligence Test by Cattell and Cattell, study habits inventory by Patel and Mathematics study Attitude Scale by Sundarajan. Mean, S.D., t-test, chi-square, one way and two way ANOVA were used to treat the collected data. The major findings were (i) Both the CAI strategies were superior to the traditional method of instruction and CAI with TSS was more effective than CAI without TSS for underachievers (UA). (ii) Except achievement level, all the other learner variables combined with the treatment had no interaction effect on the achievement score. (iii)

There was no relationship between the post treatment scores and the variable 'sex', 'locale' and 'achievement level' of the experimental group. In the case of the variables IQ, study habits and Maths study attitude, the positive relationship between those variable and achievement at the pre treatment level was found to be cancelled at the post test.

Sindhi, N.O. (1996), conducted a study on "The construction and Try out of Multimedia Package for the Teaching of Physics in Standard XI". The objectives of the study were (i) To develop multimedia package in Physics. (ii) To study the effectiveness of multimedia package in terms of achievement of students. (iii) To studythe effectiveness of teaching physics through multimedia package and conventional method of instruction. (iv) To check the retention of teaching through multimedia package. The major findings were (i) There is a significant difference between mean of pre-test and post-test scores of the experimental group. This shows the effectiveness of multimedia package. (ii) There is a significant difference between mean post test scores of controlled group and experimental group. This proves that the teaching through multimedia packageis more effective in comparison to conventional method of instruction. (iii) There is nosignificant difference between the mean post test score and mean scores of retention testof experimental group. This shows that if the teaching is done through multimedia package than student can remember it for a longer time.

Phoolwala R.N. (1997), conducted a study on "An inquiry into the utility and Effectiveness of Microcomputers in Teaching Science for Standard X". The objectives of the study were (i) To know the utility of micro -computer for self learning on the unit 'Carbonic Compounds' of Science subject of standard X. (ii) To check the effectivenessof the used microcomputer for the selected unit. (iii) To study the effectiveness ofteaching science through microcomputer and traditional method of teaching. (iv) To know the opinion of the students towards science teaching through microcomputer. The major findings were (i) The difference between the mean scores of pre test and post test of experimental group was significant. So it can be said that students can learn effectively through microcomputers. (ii) Students can learn science effectively through microcomputer than trough traditional method. (iii) The students

revealed highly favourable opinion towards science teaching through microcomputers.

Khirwadker, A. (1998), conducted a study on "Development of Computer Software for learning Chemistry of std. XI". Khirwadker conducted a research on Development of Computer Software for learning Chemistry of std. XI, from M.S. University of Baroda. The objectives of the study were (i) To develop CAI package in subject of Chemistry for std. XI Science students, studying GSTB syllabus. (ii) To study the effectiveness of the software package in terms of instructional timeand achievement of student. (iii) To study the effect of the software package on student achievementin relation to student (a) intelligence level (b) motivations level and (c) attitude towards the package.(iv) To study the attitude of the student and teacher regarding the effectiveness of the CAI packagewith regard to aspects of the software such as content of the software, presentation of the software,examples and illustrations, graphs and figures, evaluation items, utility of the software andinstructions given in the instructional manual that are provided with the software.The three chapters were selected based on difficulty level. In the actual experiment design was pre-test, post-test design. The data was quantitative as well as qualitative including teachers and students' opinion about the package. The data analysis was done by ANOVA, ANCOVA and content analysis. The sample for experiment was 30 students in experimental group and 30 students in control group randomly taken. The time duration was one month for both the groups. Investigator had collected data of achievement through pre & post-test and data about attitude towards package through structured and unstructured interview schedule.It was found that the software package developed for teaching three units of std. XI Chemistry textbook of GSTB was effective in terms of student's achievement. Also CAI was found to be time effective. The experimental group took 45 hrs time in average to complete the three units of Chemistry. Later on the academic achievement of students of experimental group was found to be affected by variables like IQ, academic motivation and attitudes and lastly, majority of experimental group students had positive attitude about various aspects of software package especially regarding presentation of content logical sequencing and language used for understanding the content. The school subject teacher always held the positive attitude.

Zyoud, M. (1999), conducted a study on "Development of Computer Assisted English Language Teaching for VIII standard students". The objectives of the study were: (i) To develop a Computer Assisted English language teaching program for standard VIII Gujarati medium students. (ii) To study the effectiveness of the Computer Assisted English language teaching program on students achievement in terms of Vocabulary grammar and comprehension by taking pre test and IQ covariate. (iii) To study the effectiveness of the Computer Assisted English language teaching program on the experimental group students' achievement of all above mentioned with respect to their intelligence, motivation and attitude. The method was used development of the software package four lessons were selected based on opinion of teachers and students regarding difficulty level of these lessons and the difficulty of teaching them. After selecting lessons, content analysis was carried out. Students studying in standard VIII Gujarati medium were taken from two schools to serve as the sample for the study. Students of one school i.e. Rosary School, Baroda formed the experimental group and student of the other school i.e. GEB school, Baroda formed the control group. The tools used in the pilot study were also used in the final experiment namely pre test, Raven's progressive matrices sets A, B, C, D and E (Raven, 1960). Junior Index of motivation by Frimer (1970) and translated into Gujarati by Dr. Desai (1970) and post test. To study attitude of the students towards the package the researcher developed and administrated an attitude scale on the experimental group only after the final experiment. The major findings were (i) The findings show that when the computer is used to its full potential it can create an atmosphere where the students can learn and interact with the computer without being afraid of the teacher's presence. (ii)The computerized exercise can help the student become familiar with significant amount of vocabulary, grammar and comprehension because it provides effective individualized instruction.

Yadav, S. (2000), conducted a study on " Effectiveness of the computer software for students of std-1st". The objectives of study were (i)To study the effectiveness of computer software in terms of achievement of the students. (ii) Top study the effectiveness of computer in terms of (a) Perception of teachers (b) Perception of students Student's of standard 1 were randomly selected as sampled for alphabet software and animal software. Tools were constructed to be used as pre-test

and post-test, semi structured interview was taken up for teachers and informal interview and observation for students. The major findings of the study were a significant gain in terms of mean achievement on the software on alphabets and animals. Most of the students were found to have positive reaction towards the software.

Karia, L. (2001), conducted a study on "Effectiveness of Computer-Aided Learning (CAL) Programme as Self-study Technique". The objectives of the study were (i)To develop Programmed learning material and computer aided learning programme for the unit 'Set Theory' (Gujarati) in mathematics of standard VIII. (ii) To develop lesson planning for the unit 'Set Theory' (Gujarati) in mathematics of standard VIII for conventional method of instruction. (iii) To study the effectiveness of Computer Aided Learning (CAL) programme with relation to programmed learning and traditional teaching.The experiment was carried out under 'Three groups randomized subject only post-test designs'. Students studying in standard VIII Gujarati medium of Rajkot city were taken from two schools to serve as the sample for experiment and replication of the study. 64 boy students of Shri Mahatma Gandhi Vidyalaya were taken for experiment and 44 girl students of Gyandip Vidyalay were taken for the replication. The teacher made posttest was administered to collect the data. The data were analyzed with the analysis of covariance. The major findings of the study were as under. (i) Traditional method of teaching and Computer Aided Learning programme were equally effective for boys. (ii) For girls traditional method of teaching proved more effective than CAL programme. (iii) Programmed learning material and CAL programme were equally effective for both the boys and girls.

Dangar, B. (2003), conducted a study on "**A study of construction and effectiveness of CAI in English for the units Sasa Rana in English for the students of std-7th**". The objective of study were (i)To develop CAI package in subject of English for the students of std-7th in Sasa Rana.(ii) To study the effectiveness of CAI on students achievement. (iii) To study the attitude of the students regarding the effectiveness of CAI. Investigator had taken the sample of 64 students through randomization Methods were similar for both controlled and experimental group. Major findings of the study were as under. The findings of the study revealed that the effectiveness of CAI was as same as in traditional method. No

significant difference was found between both the methods CAI program takes place of best teacher.

Sharma D. (2003), conducted a study on "Study of effectiveness of Computer Assisted Learning in Chemistry for the students of Standard XI". The objectives of the study were (1) To develop computer assisted learning in chemistry for standard XI students. (2) To study the effectiveness of CAL in chemistry in terms of achievement of standard XI students. To study the reactions of standards XI chemistry students regarding for effectiveness of developed CAL. The investigator had taken the sample of 35 students of standard XI science from two division of Std XI class. The tools of the study used by the researcher was an achievement test was prepared for taking pre test and post test of the sample keeping in mind the topic organic compound of 20 marks in order to study the reaction of the students and the teachers towards the developed CAL a three point reaction scale was prepared containing 15 statements. The finding of the study were as follows(1) CAL was found to be effective for teaching chemistry at standard XI.(2) Students reaction towards CAL was found to be favourable related to interest, content and presentation.(3) The chemistry teacher had given favourable statement regarding content language and mode of presentation.

Parmar, J. (2003), conducted a study on "**Effectiveness of Computer Aided Instructional Material on Chemistry for Gujarati Medium students of standard XI**". The objectives of study were (i) To develop computer aided instruction material in chemistry on shape of orbital's for standard XI. (ii) To study the effectiveness of CAIM in terms of achievement of students. (iii) To study the reactions of the students towards the effectiveness of CAIM. (iv) To study the reactions of the chemistry teacher towards the effectiveness of CAIM. The investigator used purposive sampling method for selection of sample. An achievement test was prepared by the investigator. Fifteen multiple choice items were constructed for the achievement test. Major findings of the study were as under CAIM was found to be effective for teaching learning. CAIM was helpful to understand abstract concept like "shapes of orbital''. CAIM was helpful for increasing interest of students in chemistry. The use of moving objects in CAIM increased the effectiveness. The reactions of students and teacher were found positive towards CAIM.

Patel, R. (2001), conducted a study on "**Learning through Computer Assisted Learning Material in relation to selected production variables and contiguity**". The objectives of the study were (i) To study analyze CAL material in relation to the production variables and contiguity. (ii) To study the effectiveness of CAL material in terms of mean achievement of students.(iii) To study the learning through various message items in relation to production variables and contiguity. The sample consisted of thirty students of std-8 from Shreyash Vidyalaya. Manjalpur, Vadodara which were selected purposively for the study. The major findings of the study were (i) The correlated T value on CAL material on solar system and magnet was found to be significant at 0.01 levels. So there has been significant gain through interaction with the CAL material.(ii) Largely the status of CAL material was found to be significantly higher on production variable and contiguity Vis a Vis achievement.

Chhagh, S. (2004), conducted a study on "Development and Effectiveness of Computer Aided Instruction (CAI) Programme for Teaching the Unit 'Flower and Fruit' (Gujarati) in Science of Standard VII". The objective of the study were (1) To develop a Computer Aided Instruction (CAI) Programme for Teaching the Unit 'Flower and Fruit' (Gujarati) in Science of Standard VII. (2) To try-out the effectiveness of the package in the context of the academic achievement of the students. (3) To study students' reactions towards learning through the Package. The present research was of experimental type. The design was 'Two groups randomized subjects only post-test design'. The experiment and replication both were carried out. The teacher made test and the opinionnaire were used as tools. The scores obtained in the post-test were analyzed by Mann-Whitney U-test and the opinions were analyzed by chi-square technique. The findings of the study were (1) The Computer Aided Instruction (CAI) Programme was more effective that traditional method of teaching. (2) Students showed favourable attitude towards CAI Programme.

Vyas, M. (2005), conducted a study on "Development and Effectiveness of Computer Aided Instructions (CAI) Programme for teaching the unit 'Micro Organisms' in science and technology of Standard VIII". The Objectives of the study were (1) To develop Computer Aided instruction (CAI) Programme for teaching the unit of 'Micro organisms' (Gujarati) in science and technology of

standard VIII. (2) To Tryout the effectiveness of the packages in the context of the academic achievement of the students. (3) To students reactions towards learning through the Package. The Present research is of experimental type. The design was "Two groups randomized subjects only post-test design" One Division from Standard VIII of Shri Virani Vividhlaxi Vidhyalya was selected and divided into two groups randomly. The experiment and replication both were carried out. The data for the analysis was collected by the teacher made test and opinionnaire. 't' test and Chi-square technique of statistics were used for analysis. The findings of the study were (1) There was no significant difference between the scores of subjects of two groups. So, both CAI programme and traditional method of teaching were equally effective with reference to the achievement of the students. (2) The students expressed favourable opinions towards CAI programme.

Badiyani, I. (2008), conducted a study on "**Development and Comparison of the Effectiveness of Computer Assisted English Language Learning Package and Computer Aided English Language Learning Package**". The objectives of study were (i) To develop a Computer Aided English Language Learning (CALL) Package to teach action verbs in English language. (ii) To develop a Computer Assisted English Language Learning (CALL) Package to teach action verbs in English language.(iii) To try-out the Computer Aided English Language Learning Package as compared to the Computer Assisted English Language Learning Package. (iv) To compare the relative effectiveness of the Computer Aided English Language Learning Package and the Computer Assisted English Language Learning Package in terms of scores obtained by students on the teacher's made achievement test. (v)To compare the level of attainment of a group of students that has not received any instruction with the students of Computer Aided English Language Learning (CAiLL) Package group and Computer Assisted (CAsLL) English Language Learning Package group.(vi) To study students' reactions towards learning through the Computer Aided English Language Learning Package and the Computer Assisted English Language Learning Package. The population of the study comprised of computer acquainted students studying in standard VIII of Gujarati medium schools of Gujarat State. Total 282 students of grade VIII from four schools were selected as sample. The research was of experimental type. The research design was 'Three equivalent groups only post-test design'. Three groups were experimental group I (CAiLL Package group),

experimental group II (CAsLL Package group) and control group (No instruction group). The groups were made equivalent by the students' previous achievement in English and their teachers' rating. An achievement test of fifty marks was constructed by the researcher on the basis of the objectives, analysis of the content and the blue-print. In order to measure the opinions of the students towards the CAiLL Package and the CAsLL Package, the opinionnaire developed by Ambasana (2002) was adapted. The data obtained were analyzed using one way ANOVA, Tuckey test and Chi-square techniques of statistics. Major findings of the study were (i) CAiLL Package and the CAsLL Package each was found effective in raising students' achievement in unit 'Action Verbs' of English grammar.(ii) Compared both the Packages with each other the CAsLL Package proved to be more effective than the CAiLL Package in terms of the achievement scores of the students of grade VIII for learning 'Action Verbs' of English grammar.(iii) The CAiLL Package and the CAsLL Package were also effective in evoking positive reactions towards the use of them in learning English grammar especially 'Action Verbs'.

Patel, Kinnary (2008), conducted a study on "Computer Assisted Instruction in Physics for the students of standard XI: An Experimental study". The objectives of the study were (i) To develop Computer Assisted Instruction package on two units of physics for XI Science student studying GSTB syllabus. (ii) To study the effectiveness of the CAI package in terms of achievement of students of experimental group. (iii) To study the relative effectiveness of teaching Physics in terms of two methods of teaching Physics i.e. conventional method of instruction and CAI package for students of traditional group and experimental group. (iv) To study the relative effectiveness of CAI with reference to the sex of the students of the experimental group. (v) To know the opinions of the students of the experimental group regarding the effectiveness of used CAI in Physics. (vi) To know the opinions of the teachers of the experimental group regarding the effectiveness of used CAI in physics. The method were used the Multistage sampling technique was used by the researcher in the study. The pre-test post-test control group design was employed. Two schools, one in rural and another in urban area was selected to conduct the experiment. The sample for the experiment consisted 30 students each in traditional and experimental groups. Time duration was 28 days for both groups with

two chapters of class XI Physics text book for the experiment of the study. The tool used was an opinionnaire for students of both groups. Opinions of the expert and subject teacher were invited by an evaluation sheet. For the analysis and interpretation of the data the statistical technique such as mean, S.D., t -test and chi square test was employed. The major findings were (i) The study has resulted in the development of a CAI program on 'motion in one dimension and two dimensions' and 'Laws of Motion' for teaching Physics to the students of Class XI. (ii) The package was found significantly effective for the students of class XI of both the groups. (iii) Comparative effectiveness of the CAI method and the traditional method was measured by the experiment and CAI method was found more effective in terms of achievement scores. (iv) In relative effectiveness of the package was equally effective in teaching boys and girls. (v) Students and teachers both revealed a favourable opinion towards CAI program. The study sites 74 references.

2.4 CONCLUSION

Researcher reviewed related literatures. Many researches had been done in which CAL Package; Technology related programme had been prepared by different researchers. The research studies had been done in various areas like English, Mathematics, Chemistry, Physics Biology etc. In most of the research studies, CAP been effective .Students and teacher found to have positive response towards the developed programme.

It was felt that Computer Assisted Teaching Programmes can be beneficial for students studying Mathematics also. The present study was undertaken which is an attempt in this direction to develop a CAP in Mathematics for English medium student teachers and study its effectiveness.

The next chapter devotes itself to the research of methodology.