2.0 Introduction

“Practically all human knowledge can be found in books and libraries. Unlike other animals that must start anew with each generation, man builds upon the accumulated and recorded knowledge of the past”. - J. W. Best

Before taking up any kind of study, the related literature is acquired and studied to understand the problem. By review of the related literature the problem becomes clear and it directs the researcher in proceedings in his subject. It helps the researcher to know about the research methodology, tools and instruments, which proved to be useful and promising in the previous studies.

According to W. R. Borg, “The literature in any field forms the foundation upon which all future work will be built. If we fail to build the foundation of knowledge provided by the review of literature, our work is likely to be shallow and naïve and will often duplicate work that has already been done better by someone else.” From this statement, it can be said that for clarification and proper solution of the problem selected by a researcher, the review of the research is essential.

A summary of the writings of recognized authorities and of previous researches provides evidence that the researcher is familiar with what is already known and what is still unknown and untested. Since effective research is based upon past knowledge, this step helps to eliminate the duplication of what has been done, and provides useful hypotheses and helpful suggestions for significant research. This research was taken up to test the effect of Vedic Mathematical Techniques on Mathematical skills at class VII. For this two groups were taught separately by two
different teaching techniques. (1) Vedic Mathematical Techniques and (2) Conventional Mathematical Techniques, in which the effectiveness of a Vedic Mathematical Techniques was to be relatively tested against the Conventional Mathematical Techniques of Teaching.

It is inevitable for the researcher to read and review the related literature according to the objectives. For this, the researcher has taken the review of related literature in two ways:

(1) Theoretical literature and

(2) Research literature.

2.1 Theoretical Aspect of the study

2.1.1 Concept and origin of Mathematics

The term ‘Mathematics’ may be defined in a number of ways. It is an exact science which is related to measurements, calculations, discovering relationships and dealing with the problems of space.

According to new English dictionary, “Mathematics- in a strict sense – is the abstract science which investigates deductively the conclusions implicit in the elementary conception of spatial and numerical relation”.iii

In Hindi we call mathematics as ‘Ganita’ which means the science of calculations. It is a systematised, organised and exact branch of science.

In the beginning our knowledge of mathematics is based on our observations of physical and social environment i.e. it arises out of practical applications. We form certain intuitive ideas or notions known as axioms and postulates. These are self evident truths.

Mathematics is also called the science of reasoning. According to Locke, “Mathematics is a way to settle in mind a habit of reasoning.”iv There are only a few
premises on which we base our reasoning. Reasoning in mathematics is of two types (i) inductive reasoning and (ii) deductive reasoning.

Problems should be linked with every topic and subject. These problems would have bearing not only on the subject but also on life. The practice in solving problems helps in developing speed, accuracy and ability to apply mathematical facts in different solutions. Problem solving trains the student in attacking and solving problems.

Selection of problems is quite important because all types of problem do not help in development of problem-solving skills. Broadly speaking following four types of problems are found in Mathematics.

1. Puzzle problems are those problems which may puzzle the minds of the students. This type of problems is generally used as a sort of pastime.
2. Catch Problems are those which catch on trick and they involve jugglery of words. Such problems are quite useful to test mental alertness of the students.
3. Unreal Problems which have no relationship to real life situations. They give a false idea of what happens in life e.g. an aeroplane is flying at the speed of 5 km/hour.
4. Real problems which are taken from life. The solving of real problems helps in training the child to grapple with new situations in his real life.

Real problems occupy an important place in Mathematics. This type of problems helps in the achievement of the aims of subject and they should form an integral part of Mathematics curriculum.

The following points should be kept in view while selecting problems of Mathematics:
1. It should have some practical and social value.

2. It should be in accordance with the level of the pupils.

3. It should be related to the general interests and achievements of pupils.

4. It should be selected from common life situations.

5. It should be worked in simple and understandable language.

6. The problems from other school subjects at a particular stage, may also be included in the curriculum.

7. The problem should pose a challenge to the intellect of student but it should be capable of being solved with reasonable amount of effort.

8. The problems that develop skills and attitudes required for preparing a sound base for higher studies and for vocations in life should also be included.

2.1.2 Mathematics Education in India

The review of empirical research on learners’ assessment shows that there are two distinct phases. The period up to 1990 is characterized as the first phase and the researches and empirical studies undertaken after 1990 fall into the other category. A main characteristic of the empirical studies in the first phase was that these were mainly academic in nature and the administrators did not use their findings for policy reforms. The focus on learning has its roots in the world roots in the world conference on Education For All (EFA) held in Justine, Thailand in March 1990 as “focusing on learning” as one of the five components of an “Expanded Vision”. This was followed by Dhakar after a decade in 2000 with affirmation that quality is a fundamental determinant of enrolment, retention and achievement.

The level of achievement of children considered as a major indicator of the quality in EFA and MDGs, so attempts were made to assess the standards actually achieved by learners and tests were developed to measure learner achievement.
through surveys and empirical studies. In India the government’s concern with educational achievement took a concrete shape as late as in the 90s with the formulation of the MLL document, which specified the standards that all children had to achieve at the primary stage. The Minimum Levels of Learning (MLLs) had to be followed by all schools across the country, and were an attempt to bring education of a comparable quality to all children.

DPEP to assess the level of achievement of children as a major component of their intervention and it was conducted in more then 46 districts in 1993/94 as a baseline where a total of 24,504 student of class IV/V, 23,056 student of class II and 5114 teachers were covered. In 1997/98 the tests were conducted in the 42 phase one district as a mid-term assessment and 66,831 students, 6,221 teachers and 2068 schools were assessed.

Most comprehensive evidence on the children’s learning levels come from ASER report of Pratham. The Annual Status of Education Report (ASER) 2005 presents dismal picture with regard to basic competencies of a substantial percentage of children. If we see at all India level about 40 per cent of children of grade V do not possess competencies commensurate with grade II in reading. Similarly over 53 per cent of children do not have competencies of grade II, in mathematical abilities (division and subtraction).vi

In a recent survey done by NCERT to assess the achievement of class V students in EVS, mathematics and language showed that the distribution of scores covered the entire range from 0 to 100 percent. However, the overall average performance of students in EVS, mathematics and language was 50.3%, 46.5% and 58.6% respectively. The average achievement in EVS was 50.3% with standard deviation 20.67.vii
Although there are very few studies done in India to assess the achievement level of children in India but the results are very common for all the studies. These studies basically try to assess the children’s achievement on the basis of their scores in the subjects, so most of the studies talk about the average or mean score of the students where in this study we are critically trying to reflect upon the ability of the children in the form of can and cannot, means weather a child have this competency or not.

2.1.3 Present Scenario of Mathematics Education

Formulate some possible alternatives for mathematics education around the year 2020 and to raise discussions about the future of teaching the subject. Keeping in mind that mathematics education is a sub-system of many supra systems and that there is no direct study in the area, some prospective analyses at different levels - whether global, regional or national -were reviewed. Three major scenarios were suggested for mathematics education to take place in the year 2020; the progressive, reformatory and conservative scenarios. A comparison has been carried out among the components of mathematics curriculum in each of these in that year. Although any of these alternative conceptions might not become a reality, it is hoped that the process of prospective analysis itself will contribute to “making the future”. By prospective scenarios for mathematics education, the writer means different major trends in scenarios of mathematics education around the year 2020 in different countries, in which each of these is supposed to be implemented in some different forms according to the particular soci-economic, cultural and educational conditions of each country at that time. The same thing is applicable in the same country with regard to the variety in the quality of education provided in different kinds of schools, with different methods of teaching, facilities, educational activities and the like. Needless to say, mathematics education is a sub-system of the education system
in a country, which -in its turn - is a sub-system of the societial as well as the regional and the world (human) systems. But, however, in such general terms, as dealt with in this paper, some kind of high level of abstraction is needed across some prospective analyses at the global, regional or national perspectives, whether they are dealing directly or indirectly with education.

Globalization seems to be the most important core resulting from global prospective analyses. Concerning human resources development, the OECD report has pointed out that: “Reform priorities often include improved access to early childhood education and revitalising schools. They include better linkages between work and learning and creating incentives to invest more in lifelong learning”\textsuperscript{viii}. The study of the Arab Thought Forum suggested that mathematics must constitute one group among four integrated groups of subjects, in the framework of the “outbreak” scenario. Although the research project “Egypt 2020” has adopted five scenarios, studies in the area of education in this project have grouped them into three with regard to the degree of their contribution to the development of education in the country. The “best” of the suggested alternative scenarios deal with curricula, in general, in terms of integration, self-learning, developing creativity and “complexity”, with an emphasis on some affective aspects. It seems that the world is approaching an era in which the classification into social classes is "globalized" across the whole globe, with many common characteristics of different classes among different countries. To the best of the writer's knowledge, there is no study dealing with prospective analysis in mathematics education in particular, at any level (national, regional or global).

By recent prospective analyses we mean futuristic studies whose reports were published or which were conducted within the last five years. However, reference
may be given to prospective studies published in the nineties.

From the study of The National Intelligence Council (NIC), major global scenarios are: Inclusive globalization, pernicious globalization, regional competition and post-polar world. Although the OECD study concentrates on one prospective world scenario as being entitled "The World in 2020; Towards a New Global Age"\textsuperscript{xix} reference has been made to the fact that "such worse scenarios could be envisaged - for example, a reversal of the process of globalization could lead down the road of global fragmentation, with adverse effects for prosperity and political stability". Some of these priorities cope with and require the adoption of the new paradigm of teaching mathematics, as being moved from the formal teaching to dealing with "a living body" as well as integrating the subject with life and continuing education. These groups are; languages, mathematics, science and technology, and subjects related to "human building and citizenship". The adopted scenarios were: The "decline", the "reformatory" and the "outbreak" scenarios. These scenarios are: the business as usual, the Islamic state, the neo-capitalist, the neo-socialist and social solidarity (popular). We concentrate on the major curriculum components; aims, content, teaching / learning processes and evaluation. The author uses "actual aims" instead of aims related to those of teaching mathematics as mentioned in official documents since those may have nothing to do with reality. The term "traditional formal teaching" is used to refer to "formal" teaching where the focus is given to theories and proving the validity of new statements. Theorizing is not necessarily related to some studied former theories. It is rather establishing new theories.

Quality education has diverse connotations in the literature on education and development, especially in the context of developing countries. Millions of children from poor families study in schools which are devoid of any infrastructure, lacks basic
learning environment, inadequate number of teachers and their chronic absence, teaching learning material and books. It is not very difficult to visualize in such situations the quality of learning outcomes, which can be aggregated through the term quality education. By learning outcomes one would mean children attaining certain basic competencies and skills commensurate with their age and grade in which they are studying/completed. The results in several parts of the globe are very depressing, which would mean that while children spend considerable time in schools, due to host of reasons effective learning outcomes are minimum or negligible in terms of their achievement of basic competencies. Large number of dropout and non-enrolment in education system in developing countries is also attributed to this absence of any learning outcomes from the education system. Interventions to address these would essentially entail diagnosing the problem and developing effective strategies that would enable effective teaching learning transactions leading to better learning outcomes. Aided Action, as an international organization working in the area of education is addressing this through systematic strategy and substantial resources are devoted towards improving quality of education.

The basic competencies in language and mathematics at the primary level of education are as important as the foundation of any building. The issue of quality is directly linked with these basic competencies. If a child is not able to read write or do some simple arithmetic calculations, how can she/he be able to achieve the goal of quality education? The quality of a school depends on a variety of factors including infrastructure, presence and motivation of teachers, minimum teaching standards and a minimum achievement level of pupils. Since the primary aim of an educational institution is to ensure that all the learners acquire the desired skills and knowledge (Aggarwal 2000), the quality of a school can be estimated by the extent to which
students have acquired knowledge, skills, values and attitudes, which refer to the actual learning outcomes.

2.2 Mathematical Techniques of Teaching

There are many techniques which can be effectively used for the teaching of mathematics. Some of these are oral work, home work, assignments, self study, group work, review and supervised study etc.

2.2.1 Oral Work

Oral work is done orally without the help of pen and paper, Oral work occupies a special place in life and in mathematics. Mathematics is science of figures and written work. Major part of mathematics has to be covered in written form, but its application lies in oral form. If the principle of mathematics can be discussed orally it is more helpful. The importance of oral work in mathematics is discussed below:

**Importance of oral work**

1. It trains the pupils in solving day-to-day problems of life. Oral calculations have to be done in life at many a occasions because we are not excepted to carry pen and paper all the times with us.

2. It develops mental alertness and quick thinking.

3. It develops speed in solving problems.

4. It helps the quicken wits and sharpen intelligence.

5. It keeps students attentive and alert in the class.

6. It helps in maintenance of discipline in the class.

7. It helps it appeals to the eyes and ear so it is liked by the pupils.

**Precautions to be observed in Regard to Oral Mathematics**

1. Oral Work be based on the Previous Knowledge of the Students.

2. Oral Work be used as a Means of Revision and Test.

4. As far as possible this method should not be used in fractional and decimal work and such other works.

5. The teacher should not reach to any conclusion about students on the basis of the oral Mathematics. He should try to give some practice of this form of Mathematics every day in the class.

2.2.2 Written Work

The figures and other things put into black and white and most of these have to be done on the paper. Written work has an important place in mathematics and it is only in written work that the concentration of attention can be maintained.

Purpose of Written work

1. Written work helps in testing the knowledge imparted orally.

2. Written work helps in conduct of bigger classes.

3. In written work we can make the students to work in accordance with proper rules and processes.

4. It enables the teacher to know the amount of work done by the students.

Importance of Written Work

1. Written work helps to make clear the thoughts and proper reasoning. It is quite helpful in mental development of the student.

2. Using written mathematics we solve the problems correctly without any fault and flaw.

3. In future life we have to make use of written mathematics.

4. The chances of mistakes are diminished to the minimum in written Mathematics.
5. Written work is quite helpful in solving lengthy problems and complicated sums which are a bit difficult to be solved orally.

Precautions about Written Work

1. Instructions about the Process of Actual Work.
2. Written work must keep in Mind the Mental needs of the Students.
3. Written work should be such that it keeps the entire class busy.
4. The written work should be examined thoroughly and properly.

2.2.3 Drill Work

Drill is a way to revise a lesson that has already been taught. Thus it is a means to strengthen the knowledge already acquired. Drill work is based on the principle of learning by doing and on the law of exercises.

Importance of Drill Work

1. It is the most effective means of fixing the impression of learned facts in mind.
2. It helps in development of communicational skills. Such skills are quite helpful in learning of Algebra, Arithmetic and Geometry.
3. It helps in developing speed and accuracy in learning of mathematics.
4. It helps in clarifying even the minutest details of the topic.
5. It has been found quite useful particularly in case of average or below average students.
6. Drill is quite helpful in revision and review work/
7. Drill provides an opportunity to the student to work independently.
8. It helps the teacher to know the weakness of the students and provide individual attention to them.
Precautions about Drill Work

1. Drill work should be properly planned. The teacher should be clear about the timing of drill work and the quantum of drill work needed at a particular stage.

2. It should be meaningful. The students must know boring or unpleasant. The teacher may use teaching aids and also introduce play spirit in drill work.

3. The drill work should be individualised to the maximum possible extent. All the students do not have the same level of learning and intelligence. The consideration of individual differences should always be kept in mind.

4. The drill work should always be based on the facts taught. New facts or rules should not be given in drill work.

5. The achievements of learners should be evaluated frequently.

6. The teacher should provide proper environment for drill work.

7. For success in drill, the drill work should be grade properly.

2.2.4 Self Study Work

Self study means independent work to be carried out by the students. In self study, the individual studies and learns by himself. He attempts and solves every problem himself. So self-study is a habit of independent learning so that the students are able to solve problems acquires knowledge and skills of Mathematics with their own independent efforts.

Importance of Self Study Work

1. It prepares the students for real life where he can not depend on others.

2. It discourages cramming.

3. It helps in proper utilisation of leisure time.

4. It helps in widening the mental horizon of the students.
5. It helps in developing the interest of the students in the learning of Mathematics.

6. Self-study is the best way to supplement class-teaching. Self-study is the best way to practice various things.

7. By self-study the students learn to make use of their knowledge in tackling various problems.

**Suggestions for Encouraging Self-Study**

1. An effort be made to convince the students about the fact that Mathematics is best learnt through self-effort.

2. An all out effort be made to inculcate the habit of self-study in the students at the earliest possible stage.

3. Teacher should properly grade the work that he wishes to accomplish through self-study.

4. The students be also trained to take notes in independent self-study.

5. The students who study independently should be praised publicly.

6. The cooperation of parents should be sought to ensure regular progress of a student in self-study,

7. The teacher should ask the students to read a topic in advance, before taking it up in the class.

8. The work accomplished by the student in self-study should be checked, corrected and evaluated by the teacher.

**2.2.5 Group Work**

There are a number of techniques which can be effectively used for the teaching of Mathematics. Group work is a via-media between class teaching and the individuals independent work, since individual methods of work are almost impossible
under the present circumstances and class teaching does not fulfil the purposes of modern education. We have to strike a via media in the form of Group.

**Importance of Group Work**

1. Group work is useful in large classes, where there are wide individual differences. The pupils of almost the same level are put in the same group.
2. It solves the problem of paying individual attention.
3. It provides healthy change in the class-room atmosphere.
4. Group work facilitates mutual exchange of views. The students are able to consult the members of the group and the teacher. It develops in them social habits such as cooperation etc.

**Scope of Group Work**

1. Home work is to be done.
2. Assignments are to be completed jointly.
3. Oral drill is conducted in the earlier stages.
4. Activities, practical work, project work etc. are to be completed.
5. Mathematics room is to be decorated etc.

**2.2.6 Assignment Technique**

Assignment is a work allotment. It is the work assigned to the student. It may be done by the student at the home or at school. There may be a pre-lesson or post-lesson assignment. Assignment is a sort of undertaking or commitment on the part of the learner. Assignment is a sort of self-study which supplements class-room teaching. In these techniques, the teacher assigns work, provides guide lines and sets time limit for the completion of assignment. The teacher may write it on the black-board, dictate it or it may be given in the form a cyclostyled it typed sheet.
Various Steps in the Assignment

1. Planning of the assignment work
2. Providing guidelines
3. Supervising the work assigned.
4. Evaluating the assignment Work.

Characteristics of Assignment

1. It should have correlation with previous knowledge and experiences of the pupils.
2. It should have clarity and definiteness.
3. It should help in removal of pupils difficulties.
4. It should be stimulating.
5. It should take into consideration the individual differences.

Suggestions for effective assignment

1. The purpose of assignment should be clear to the teacher as well as to the students.
2. The assignment should be properly planned, keeping in mind the level of students and the availability of time.
3. Assignment must have clear-cut hints. So that the pupils can do the work following these directions.
4. Assignment should be directed at the weak points of students. It should clarify their doubts or misunderstandings.
5. The assignments should be given according to the individual differences in pupils. The bright and weak pupils should not be given the same type of assignment.
6. The assignment work should be a cooperative activity wherein the teacher and the pupils participate actively.

7. The assignment work should be properly checked and mistakes be pointed out.

The assignment if properly planned and evaluated, cultivates the habit study in the pupils. Pupils learn to finish their work with their own efforts. It is a sort of self-study which supplements class teaching. The success of effectiveness of assignment depends on the amount of work done independently by the students.

2.3 Vedic Mathematics

2.3.1 Background of Mathematical Information in the Vedas

The word “veda” has two basic meanings. The first, a literal translation of the Sanskrit word is “knowledge” (Veda). The second, and most common meaning of the word, refers to the sacred ancient literature of Hinduism, the Vedas, a collection of hymns, poetry and Hindu ceremonial formulae (Veda). Believed to be one of the oldest human written records, the Vedas date back over 4000 years (Gaskell, 2000).xi Tradition all, the were passed down orally and adapted from generation to generation by sacred sages called rishis before eventually emerging written in Vedic, an ancient form of Sanskrit.

The Vedas are divided into four main sections: the Rig-Veda, sama-veda, Yajur-veda and the Atharva-veda, known collectively as the Samhitas (Veda). The first three, the Rig-Veda, Sama-Veda, and Yajur-veda are basically ritual handbooks that were used by priests during the Vedic period (1500-500BCE) (Veda). Vedic mathematics is apparently part of the fourth Veda, Atharva-veda, which is distinct from the others in contains hymns, spells and magical incantations for personal and domestic use (Veda). Also, the Atharva-veda, which was written later than the other Vedas, was not always considered authoritative, but only became so after being
accepted by the Brahmans, the highest order of Hindu priests (Veda). Collectively, the Vedas include architecture, astronomy etc. (Gaskell, 2000).xii

Although there is controversy about whether the Vedas themselves actually include reference to mathematics, the sophisticated mathematics has actually been traced back to the Vedic era. Ancient Indian Vedic civilizations are known for being skilled in geometry, algebra and computational mathematics complex enough to incorporate things like irrational numbers (Dutta, 2002). Furthermore, all ancient Indian mathematics literature is composed completely in verse; there was a tradition of composing terse sutras, like those of Vedic mathematics, to ensure that information would be preserved even if written records were damaged or lost (Dutta, 2002).xiii

2.3.2 Advantages and Benefits of Vedic Mathematics

• It reduces the burden of remembering large amount of stuff because it requires you to learn tables up to 9 only.

• It enables faster calculations when compared to the conventional method. Thus, the time that gets saved in the process can be used to answer more questions.

• It acts as a tool for reducing finger counting and starch work.

• It plays an important role in increasing concentration as well as improving confidence.

• It is very simple, direct totally unconventional, original and straightforward.

• It encourages mental calculations.

• It enriches our understanding of Mathematics and enables us to see links and continuity between different branches of maths.

• Vedic Mathematics system also gives us a set of checking procedures for Independent cross checking of whatever we do.
• It keeps the mind alert and lively because of the element of choice and flexibility at each.

• Holistic development of the human brain takes place through Vedic Mathematics along with multidimensional thinking.

• Vedic Mathematics system to quite an extent also helps us in developing our spiritual part of personality.

• It can introduce creativity in intelligent and smart students, while helping the slow-learners grasp the basic concepts of mathematics. More and more use of Vedic math can without any doubts generate interest in a subject that is generally dreaded by children.

• High Speed Vedic Mathematics is 10 – 15 times faster than normal Maths.

• It helps in intelligent guessing.

• It improves mental calculations.

• This system also increases concentration.

• It also boosts up the confidence of a student.

• This system helps in removing the unnecessary burden.

• By practicing the technique of Vedic mathematics one can reduce Maths phobia.

• This system makes Mathematics interesting.

• It helps in verification of answers.

• This is a flexible for mental system.

• Pupils can invent their own methods. They are not limited to one correct method. This leads to more creative, interested and intelligent pupils.

• Better and Much Improved Academic Performance in school and Instant Results.
- A complete System comprising all the benefits of Mental Maths.
- Vedic Mathematics cultivates an interest for numbers and eliminates the math phobia present in the students.
- Vedic Mathematics is easy to understand, easy to apply and easy to remember.
- Increases your speed and accuracy, Become a Mental Calculator yourself.
- Improves memory and boosts self-confidence.

### 2.3.3 The Main Sutras of Vedic Mathematics

<table>
<thead>
<tr>
<th>No.</th>
<th>Sutra</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>एकाधिकन पूर्ण</td>
<td>By one more than the one before</td>
</tr>
<tr>
<td>2</td>
<td>निकिल्ल नवतिशृः दशाः</td>
<td>All from 9 and last from 10</td>
</tr>
<tr>
<td>3</td>
<td>ऊर्ध्व तिर्क्क्रयाम</td>
<td>Vertically and Cross-wise</td>
</tr>
<tr>
<td>4</td>
<td>परावर्त्य योजयेत</td>
<td>Transpose and apply</td>
</tr>
<tr>
<td>5</td>
<td>शून्य साम्यसमुच्छये</td>
<td>If the samuccaya is the Same it is Zero</td>
</tr>
<tr>
<td>6</td>
<td>आनुसंध्येन शून्यमन्यत्</td>
<td>If one is in Ratio the Other is Zero</td>
</tr>
<tr>
<td>7</td>
<td>संकलन व्यवकलनाभायाम</td>
<td>By addition and by subtraction</td>
</tr>
<tr>
<td>8</td>
<td>पूणापूणाभायाम</td>
<td>By the Completion or Non-Completion</td>
</tr>
<tr>
<td>9</td>
<td>चलन कलनाभायाम</td>
<td>Differential Calculus</td>
</tr>
<tr>
<td>10</td>
<td>यावदूनम</td>
<td>By the Deficiency</td>
</tr>
<tr>
<td>11</td>
<td>व्यष्टि समंदिः</td>
<td>Specific and General</td>
</tr>
<tr>
<td>12</td>
<td>शेषाण्यप्रक्रिक चरमण</td>
<td>The Remainders by the Last Digit</td>
</tr>
<tr>
<td>13</td>
<td>सोपात्त्व दशमन्वयम</td>
<td>The Ultimate and Twice the Penultimate</td>
</tr>
<tr>
<td>14</td>
<td>एकन्यूनेन पूर्ण</td>
<td>By One Less than the One Before</td>
</tr>
<tr>
<td>15</td>
<td>गुणितसमुच्छयः</td>
<td>The product of the Sum</td>
</tr>
<tr>
<td>16</td>
<td>गुणक समुच्छयः</td>
<td>All the Multipliers</td>
</tr>
</tbody>
</table>
### 2.3.4 The Sub Sutras of Vedic Mathematics

#### Table 2.2
The Sub Sutras of Vedic Mathematics

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub Sutra</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>आनुसृत्येण</td>
<td>Proportionality</td>
</tr>
<tr>
<td>2</td>
<td>शिष्यते शेषसंजः</td>
<td>The Remainder Remains Constant</td>
</tr>
<tr>
<td>3</td>
<td>आधमेवनान्त्मन्त्येन</td>
<td>The First by the First and Last by the Last</td>
</tr>
<tr>
<td>4</td>
<td>केवले: सप्टका गुण्यात</td>
<td>For 7 the Multiplicand is 143</td>
</tr>
<tr>
<td>5</td>
<td>वेण्टनम्</td>
<td>By Osculation</td>
</tr>
<tr>
<td>6</td>
<td>यावदूनं तावदूसः</td>
<td>Lessen by the Deficiency</td>
</tr>
<tr>
<td>7</td>
<td>यावदूनं तावदूसीकृत्य वर्ग च योजयेत्</td>
<td>Whatever the Deficiency lessens by that amount and set up the Square of the Deficiency.</td>
</tr>
<tr>
<td>8</td>
<td>अन्त्ययोद्धकेषकोपि</td>
<td>Last Totalling 10</td>
</tr>
<tr>
<td>9</td>
<td>अन्त्ययोरव</td>
<td>Only the Last Terms</td>
</tr>
<tr>
<td>10</td>
<td>समुच्चयगुणित:</td>
<td>The Sum of the Products</td>
</tr>
<tr>
<td>11</td>
<td>लोपनस्थापनाभ्याम</td>
<td>By Alternative Elimination and Retention</td>
</tr>
<tr>
<td>12</td>
<td>विलोकनम्</td>
<td>By Mere Observation</td>
</tr>
<tr>
<td>13</td>
<td>गुणितसमुच्चयः: समुच्चयगुणितः</td>
<td>The Product of the Sum is the Sum of the Products</td>
</tr>
<tr>
<td>14</td>
<td>ध्वजाण</td>
<td>On the Flag</td>
</tr>
</tbody>
</table>

From the above table 2.2 it can be said that there are different kinds of formulas were used from the ancient time in India. In the Vedas there is also defined various number system, algebra, simple calculation, various interesting case of geometry Differential Calculus, trigonometry, integration, integral calculus in the ancient mathematical age.
2.3.5 Comparison of Conventional Mathematics Vs Vedic Mathematics

Comparison of Conventional Mathematics Vs Vedic Mathematics is described as follows.

| Single way to solve a Mathematics calculation | Multiple ways to solve. Can device your own ways |
| Memorise Tables up to 20 at least | Memorise Tables only up to 9 |
| Calculations are from right to left | Calculations are generally from left to right |
| Focus on finger counting and scratch work | Calculate Mentally |
| Algebra is difficult to understand | Child learns to reason naturally |
| Mathematics is complex | Vedic Mathematics is creative in approach |
| Mathematics is for grown ups | Any age group can solve problem |
| Mathematics has to be taught | Mathematics is intuitive |

2.4 Importance of Review of Related Literature

“Research has proved to be essential and powerful tool in leading man towards progress” – Gall and Borg.\textsuperscript{xvi} Review of related literature is the power of increasing productive work of research. It provides to choose technique in direction for inquiry of the problem in a scientific way.

According to Bourg and Goll (1983) “The related literature in any field forms the foundation upon which all future works will be built.”

Review of related literature is the way to discussing and found the nature of the problem in the context of research in scientific manner.
According to Kalbirsinh (1984). “A review of related literature helps the investigator to get the frontier in the field of his/her research and develop a research project which will contribute something to the knowledge already existing in the field.”

Agrawal (1975) discussed the importance of review of related literature is given as under.

1. Researcher can not develop the research project plan with proper framework, until he/she not gets the work done under the selected field of the problem.

2. Researcher gets and provides the information about the Review of related literature.

3. Researchers discuss the plan of procedure of to collect the information regarding the research point.

4. Researcher can take care to classification of chapters and presentation of the research work according to their importance and needs.

5. Review of related literature provides baseline of information about research problem.

6. Review of related literature provides the information that which kind of tools, approach and technique were used by the other researcher for particular objectives/research. It also helps the researcher to take action according to nature of the problem.

7. Review of related literature provides significant programmed to plan and to draw research design.

8. With this process researcher comes to know actively, and get direction to find out the various approaches of the particular field of the research.

To keep in mind the above important points, present research work carried out, which is described in full length herewith.
2.5 Objectives of Reviewing Related Literature

Main objectives of the reviewing related literature is follows as under.

1. To know the problem of the Field.
2. To decide the baseline, nature and subject of investigation of the problem.
3. After deciding the subject/topic prepare framework and plan to check/test objectives.

2.6 Discussion of Review of Related Literature

Related studies help to provide a background for the research problem. The research should be familiar with what is already known and what is still unknown and untested. For the present study the researcher collected information related to his work from journals, articles, books and doctoral these conducted regarding to teaching of Mathematics.

The literature review begins with an overview of Mathematics teaching in foreign, India and Gujarat.

2.6.1 Review of Related Research Literature in Foreign and India

Study 1:


Objectives

1. To study the aims of teaching mathematics in the context of socio-economic conditions.
2. To study how far the syllabus in mathematics reflected the objectives sought.
3. Analysis of the content in mathematics textbooks.
4. To study the methods and techniques followed in teaching mathematics.
5. To study the professional preparation of the mathematics teachers.

**Data Collection**

Data were collected through the study of literature in mathematics, mathematics textbooks, syllabus published by the Government of Kerala from time to time, and discussions carried out with various people connected with the teaching of mathematics. Questionnaires were administered to the heads of the institutions and the teachers of mathematics to collect information.

**Findings**

1. No syllabus published since 1932 gave any objectives of teaching mathematics but syllabus published in 1962 and 1964 gave the objectives of teaching mathematics in secondary schools;
2. The syllabus framed reflected the objectives of teaching mathematics to a large extent though improvement are needed in certain areas.
3. The mathematics syllabus followed in the secondary schools of Kerala is superior in certain respects when compared with the syllabus followed in Tamil Nadu and Andhra Pradesh but it is far below the level of the syllabus suggested by the NCERT.
4. It is incomparable with the syllabus followed in U.S.A. and U.K., the standard of the content is superior in these countries.
5. The content of the mathematics textbooks reveals that algebra taught does not imply functions value of subject and both analytic and synthetic methods of teaching mathematics are poorly expounded.
6. Many schools do not have facilities to teach graph, lack in instrument boxes and other mathematical models.
7. Reference books in mathematics are rarely found in the libraries of the schools.

8. About 97% of the teachers handling classes in mathematics and are trained in the methods of teaching mathematics.

9. Many teachers lack knowledge of modern trends in teaching mathematics and are not familiar with modern mathematics books and literature.

10. Home assignments are given in mathematics but only 37% of the teachers correct them.

11. Teachers complain that they do not have adequate time for handling all aspects of teaching.

12. 74% of the teachers report that the curriculum is heavy in mathematics while 58% feel that the methods followed do not inculcate the necessary enthusiasm and interest in the pupils.

**Study 2**

**Investigator:** Molia M.S., (1997)

**Title:** A study of an effect of Cognitive through process, Metacognitive process and counter suggestion process on Achievement in Mathematics. (Ph.D.)

**Objectives**


2. To study the characteristics of frequency distribution with reference to Mathematical Achievement scores of the students of different groups taught through different programmes.
3. To study the effectiveness of Cognitive Thought Process programmes, Meta-Cognitive Process programme and Counter Suggestion Process programme with respect to Mathematical Achievement, Knowledge scores. Understanding scores, Application scores and Mathematical Skills scores of the students.

4. To study the characteristics of frequency distribution with reference to Learning Process scores of the student of different groups taught different programmes.

5. To study the effectiveness of Cognitive Thought Process Programme, Meta-Cognitive Process programme and Counter Suggestion Process programme with respect to Learning Process scores of the students.


**Population and Sample**

The students studying in Gujarati medium high school in std. IX in the academic year 1995-96 in Rajkot city were considered as population of the study. The investigator selected four classes from ShriSaurashtra High School, Rajkot. Out of four classes there were 65 to 67 students. In these two classes total students were 132. These 132 students were randomly classified into four groups. In each group, there were 33 students.

**Tools**

In the present study the investigator constructed and standardized Mathematical Achievement Test on Pynomials and Linear equations of two variables of Mathematics.
Research Method

This was an experimental study.

Analysis of the Data

Analysis of variance and qualitative techniques were used to analyse the data.

Findings

1. The mathematical achievement of CTp group is higher than that of the other 3 groups. The mathematical achievement of MCP group and CSP group is higher than that of CT (Conventional Teaching) group.

2. The achievements of knowledge and understanding of Mathematics of CTP group are higher than that of the other 3 groups. The achievements of knowledge and understanding of Mathematics of MCP group and CSP group are higher than that of CT group.

3. The achievements of Mathematical Skill and application of Mathematics of CTP group are higher than that of the other 3 groups.

4. The scores of group MCP group and CSP group on learning process interview are negatively skewed and stable also (standard error of mean varies from 1.09 to 1.42).

5. The achievement of learning process of CTP group is better than that of CSP group. The achievement of learning process of MCP group is better than that of CT group.

Study 3


Title : “Effectiveness of Computer Assisted Instruction in Mathematics among B.Sc. Degree Students”.
Objectives

1. To analyse the efficiency of teaching mathematics to B.Sc. Degree students through CAI over conventional method for knowledge, comprehension and application objectives.

2. To compare the effectiveness of teaching mathematics through CAI to B.Sc. Degree students over conventional methods in terms of the levels of achievement.

3. To study the effectiveness of teaching mathematics through CAI to B.Sc. Degree students over conventional method in terms of objectives of teaching mathematics and their level of achievement.

Findings

1. There was no significant difference between the mean scores of pre-test for control and experimental group in all six units with reference to the objectives such as knowledge, comprehension and 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 that of the experimental group in all six units with reference to the objectives and their level scores of control group are significantly greater than that of experimental group in all six units with reference to the objectives and their level of achievement in both the years 1999-2000 and 2001-2002.

Study 4


Title: “Teaching of Mathematics Effectiveness of Computer-Assisted Instruction (CAI) and Conventional method of Instruction”.
Objectives

1. To study the difference in mathematics achievement this occurs as a result of the difference in the instructional strategy among boys and girls separately and as a group.

2. To study the direction of change in attitudes of male female students separately and as a group towards mathematics as a result of two different instructional strategies.

Findings

1. The students who used the computer scored significantly higher than those taught mathematics through the conventional method.

2. The students who used the computers showed significantly highly favourable attitude towards mathematics than those who did not use the computer.

3. Achievement in mathematics and change in attitude towards mathematics were found to be independent of the sex factor.

Study 5


Title: “The role of CAI in supporting fifth-grade Mathematics instruction Cognitive and attitudinal outcome”.

Procedure

This study is an examination of whether alternate ways of using of computer in mathematics instruction leads to different cognitive and attitudinal outcomes in students. Researcher had taken three different groups by randomization. One group had adopted Computer Assisted Mathematics Instruction, another had adopted the Logo program, and the third had adopted the hyper math program. Pre-test and post-
test measures were administered at the beginning and end of the school year. Mathematics attitude scale and Computer attitude scale were also used.

**Findings**

1. All students made gains on the mathematics measures from pre-test to post-test.

2. Students’ attitude towards CAI and Mathematics did not change over period of the study.

**Study 6**

**Investigator:** Pramilla, K. S. (2000)

**Title:** “Use of Computer Multimedia Programme in learning Trigonometry among High School Students”

**Objectives**

1. To find out the influence of computer based multimedia programme on achievement in Mathematics among high school students.

2. To find out the difference in achievement in Mathematics between high mathematics.

**Tool**

The researcher has constructed the self made two different test, pre-test and post-test then standardized by the experts.

**Sample**

The researcher has selected 62 students studying in standard IX was selected for the study.

**Analysis of Data**

Mean, SD and ‘t’ value was used to calculate the data.
Findings

1. There is no influence of computer-based multimedia programme on the achievement in mathematics in high school students.

2. There is no significant change in their attitude towards mathematics after learning Trigonometry through computer-based multimedia and text-based self study material.

3. There is no significant difference in achievement of Mathematics between high achievers and low achievers for both experimental and control groups.

4. There is no significant difference in the retention of learning in Mathematics between the experimental group and control group.

Study 7

Investigator: Jyoti Bhalla (2010)

Title: “Effectiveness of Vedic Mathematics on Academic Achievement of Primary School Students”

Objectives

1. To study the difference between control group and experimental group in academic achievement in mathematics.

2. To study the difference in the academic achievement of girls of experimental group and control group.

3. To study the difference in the academic achievement of boys of experimental group and control group.

Method

Experimental method was employed and Simple randomized matched group post test design was used.
Sample

The sample was restricted to 80 students out of which 40 were girls and 40 were boys studying in 5th class of Nirmal Jyoti Modern School of Amritsar.

Tool

The present study was to study the effectiveness of Vedic Mathematics on academic achievement of the student; no such standardized tool was available. So self-constructed achievement test was used.

Findings

1. There exists a significant difference in the academic achievement of the students when taught through vedic methods of teaching mathematics. The mean score of experimental group was higher than the mean score of control group.

2. There is no significant difference in the academic of girls of experimental group and control group. It was found that the girls of both experimental and control group showed similar academic achievements on the bases of scores they obtained in achievement test.

3. There exists a significant difference in the academic achievement of boys of experimental group and control group. The mean score of boys of experimental group was higher than that of control group. This shows that academic achievement of boys of experimental group is better than the boys of control group.

Study 8

Investigator: Dave P.N. (1997)

Title: “A Study of achievement test of mathematics subject of Standard -9 with reference to main and supportive assignment method of self study, literature, tap-slide programme and educational game”.

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Objectives

1. To construct achievement test of Set-Procedure, Trigonometry and plane quadrilateral topic in mathematics subject of standard -9 with reference to main and supportive assignment method of self-study, literature and tap-slide programme and educational game.

2. To study the effect of main and supportive assignment method of self-study, literature and tap-slide programme and educational game, on achievement test in mathematics subject of standard -9.

Population and Sample

In this present study 260 students of standard-9 of Forward school of afternoon shift, from Amreli district were selected as population. From the selected standard two group were selected one group of sample of the students were 63 as in experiment-1 while sample of the students were 64 as in experiment-2.

Tool used for the present study

In this present study achievement test of Set-Procedure, Trigonometry and plane quadrilateral topic in mathematics subject of standard -9 with reference to main and supportive assignment method of self-study, literature and tap-slide programme and educational game was prepared by the investigator as Teacher Made Test.

Research Method

In this present study experimental design was used to study the effect of main and supportive assignment method of self-study, literature and tap-slide programme and educational game, on achievement test in mathematics subject of standard -9.

Data Analysis techniques

In this present study t-test was used to analyze the data.
Findings

1. Self-study, literature were found significant on achievement test in mathematics subject of standard -9, while tap-slide programme and educational game has not any significant difference was found on achievement test in mathematics subject of standard -9. In the symbolic manner they are described as literature>educational games= tap-slide programme

2. Mean score of achievement test of students of standard-9, on educational games were found significantly higher than literature and tap-slide programme.

Study 9


Title : “Effectiveness of Computer Assisted Learning as a technique of Self Study”

Objectives

1. To prepare standardize Programme Learning Material (PLM) and Computer Assisted Learning (CAL) on the unit of Introduction of Set in mathematics subject of standard eight.

2. To prepare Lesson a Plan with traditional method on the unit of Introduction of Set in mathematics subject of standard eight.

3. To study the effectiveness of Programme Learning Material (PLM), Computer Assisted Learning (CAL) and traditional method teaching on the unit of Introduction of Set in mathematics subject of standard eight.

Population and Sample

Present study was delimited for the students studying in standard eight of Gujarati medium in Rajkot city during the year of 1999-2000. Two schools were
randomly selected of secondary standard eight of Gujarati medium in Rajkot city. 64 boys were selected from the school of Mahatma Gandhiji Vidhyalaya as a main experiment group and 44 girl students were selected from the school of Gyandeep Vidhyalaya as a repetition of experiment by random sampling technique.

**Tool**

Score of Achievement test and score of Mathematical Reading-adopting Competency test construction were applied as tools of the present study to collect and interpret the data. The norms of test of ‘Draw Man’ prepared by the Fatak (1956) was also used.

**Method**

Experimental method was employed and Simple randomized matched group post-test design was used.

**Data Analysis and Interpretation**

Ancova statistical technique was applied to analyse the data.

**Findings**

1. Male Students were significantly found same on the Computer Assisted Learning (CAL) and traditional method teaching on the unit of Introduction of Set in mathematics subject of standard eight.

2. Female Students were significantly found higher on the Computer Assisted Learning (CAL) than traditional method teaching on the unit of Introduction of Set in mathematics subject of standard eight.

3. Male and female Students were significantly found higher on the Computer Assisted Learning (CAL) and Programme Learning Material (PLM) than traditional method teaching on the unit of Introduction of Set in mathematics subject of standard eight.
Study 10

**Investigator:** Ambasana Anil (Ph.D.)

**Title:** “Construction and Standardization of Geometrical Instrument Development Programme”.

**Objectives**

1. To construct Geometrical Instrument Development Programme Test.

2. To construct Geometrical Instrument Development Programme. (a) In the form of Guide-Information (b) In the form of Video.

3. To study the effectiveness of score of both form of Geometrical Instrument Development Programme.

**Population and Sample**

In this present study total 120 students from standard seven were selected randomly as first sample from the private school of Shree Lal Bahadur Shastri Vidyalaya (60 Boys) and Shree Sadguru Kaniya Vidyalaya (60 Girls) from Rajkot City. In the second sampling stage 52 girl-students from standard seven were selected randomly from the private school of Shree Gyandeep Vidyalaya and 72 boys-students from Shree Sadguru Kaniya Vidyalaya.

**Tool used for the present study**

In this present study Geometrical Instrument Development Programme Test was constructed and standardize by applying item analysis on the response principle of Rash Model based on CREDIT 2 computer programme.

**Research Method**

In this present study experimental design was used to study the effect of Geometrical Instrument Development Programme.
Data Analysis techniques

In this present study Mann-Whitney U-test technique used to analyze the data.

Findings

1. Majority of the students do not have knowledge to identify and to use of Geometrical Instrument Box.
2. Very few of the students have knowledge of use of measure scale and divider, but they have true knowledge of use of instrument.
3. Students do not have knowledge of instrument of measuring Angle and divider.
4. Both form of Geometrical Instrument Development Programme (a) In the form of Guide-Information (b) In the form of Video were found helpful to develop the mean score of achievement test through using Geometrical Instrument Development Programme.
5. How much knowledge of using instrument of Geometrical Instrument Box? It can be known by using and implementation of Geometrical Instrument Development Programme.

Study 11

Investigator: Ramanuj B.B. (2001)

Title: “A study of Effectiveness of Teaching Aids based Mathematics teaching at primary level”

Objectives

1. To study the effectiveness of Mathematics teaching based on Teaching Aids on score on achievement test with comparison of use of lecture method.
2. To study the effectiveness of reliability of Mathematics teaching based on Teaching Aids on score on achievement test with comparison of use of lecture method.

3. To study the effectiveness of Standard on Mathematics teaching based on Teaching Aids on score on achievement test with comparison of use of lecture method.

**Method**

Experimental method was employed and Simple randomized.

**Sample**

In this present study students from the standard of 5, 6, and 7 were selected from the primary school of Gujarati medium. Students from the standard of 5, 6, and 7 were selected as a sample from the primary school of Gujarati medium.

**Tool**

The present study Mathematics Achievement test, Mathematics Self-Confidence Measure test and Mathematics Standard Measuring Scale was construed and used.

**Data Analysis techniques**

In this present study t-test was used to analyze the data.

**Findings**

1. Mean score of male and female students of standard 5, 6, and 7 on Mathematics teaching based on Teaching Aids were significantly found higher than the mean score on achievement test with comparison of use of lecture method.

2. Mean score of male and female students of standard 5 and 6 were found significant on Mathematics Self Confidence Measure Test, mean score of
male and female students of standard 6 and 7 were found same on Mathematics Self Confidence Measure Test.

3. Mean score of male students of standard 5 and 6, on Mathematics teaching based on Teaching Aids were significantly found higher than the mean score on achievement test with comparison of use of lecture method, while Mean score of male students of standard 5 and 6, on Mathematics teaching based on Teaching Aids were found same with mean score on achievement test with comparison of use of lecture method.

4. Mean score of female students of standard 5 and 6, on Mathematics teaching based on Teaching Aids were significantly found higher than the mean score on achievement test with comparison of use of lecture method, while Mean score of female students of standard 5 and 6, on Mathematics teaching based on Teaching Aids were found same with mean score on achievement test with comparison of use of lecture method.

Study 12


Title : “Teaching of Concept of Mathematics and evaluation Technology”

Objectives

1. To prepare a Mathematics Concept Instructional Design and Concept Attainment Model.

2. To study the effectiveness of both method of Mathematics Concept Instructional Design and Concept Attainment Model with traditional method of teaching.

3. To check Criterion Reference Text validity of Achievement Evaluation of selected mathematical concepts.
Population and Sample

In this present study students of standard 9 of Kutchh were population of the present study. To check implementation of research 214 male and 220 female students were selected, and To check Criterion Reference Text validity 210 male and female students were selected purposively sampling giving co-education in the school.

Tool

The present study Criterion Reference Test, Mathematics Achievement test and Verbal-Non Verbal Group Intelligence Test of K.G.Desai used as tool.

Data Analysis techniques

In this present study t-test was used to analyze the data.

Findings

1. Mathematics Concept Instructional Design and Concept Attainment Model were found significant than the traditional method of mathematics teaching.

2. Mathematics Concept Instructional Design was significantly higher than the Concept Attainment Model.

3. Mathematical Concepts of Number mathematics, trigonometry Geometrical Education teaching Mathematics Concept Instructional Design and Concept Attainment Model were found significant than the traditional method of mathematics teaching.

4. Mathematics Concept Instructional Design and Concept Attainment Model were found significant than the traditional method of mathematics teaching for the highly intelligent students, while Mathematics Concept Instructional Design and Concept Attainment Model found same for the lower intelligent students.
Study 13

Investigator: Joan Silvia Solomon (2010)

Title: “Develop Computer-Assisted Instructional (CAI) package for teaching ‘Science and Technology’ subject to the students of Standard IX”.

Objectives

1. To develop Computer-Assisted Instructional (CAI) package for teaching ‘Science and Technology’ subject to the students of Standard IX.
2. To study the effectiveness of CAI package in terms of academic achievement of the students in ‘Science and Technology’ subject.
3. To study the effectiveness of CAI package in terms of retention of the students in ‘Science and Technology’ subject.
4. To study the opinion of the students of experimental group towards CAI package after experiment.
5. To measure the practical significance of the statistical result of the study.

Method

Experimental method was adopted for the study. Two groups, randomized subject post-test-only design was used for the study. The present study was based on a sample of 130 students from two schools of Gandhidham and Adipur. The tools used for data collection were Achievement test, Retention test and Opinionnaire. The collected data was treated with Mean, S.D., t-test, Chi-square test and effect size.

Findings

1. CAI was found to be more effective than conventional teaching method for teaching ‘Science and Technology’ subject to the students of Standard IX.
2. The effect size in the present study indicates that the practical significance of the result was considerably high.
3. Students’ opinion towards Computer Assisted Instructional Package was favorable as far as the statements related to unit test given; self-learning, content clarity and mode of presentation are covered.

4. Incorporation of question and feedback in instructional process had a better impact. The majority of students found that the package was informative, interesting and fun to learn.

5. The majority of the students were of the opinion that learning through CAI was more effective, in all respect, then conventional class-room teaching.

6. Use of CAI did not cause stress in students.

7. Majority of the students felt that CAI packages should be developed for higher secondary stage too.


Joan Silvia Solomon (2010) Develop Computer-Assisted Instructional (CAI) package for teaching ‘Science and Technology’ subject to the students of Standard IX.


Hence, it has been observed that the majority of the researches were carried out by Construction and Standardization of Various Mathematical Development Programme, various Computer-Assisted Instructional (CAI) package for Mathematics teaching. Very few of the programs, research can be listed for the development and to check the effectiveness of mathematics teaching, learning, teaching and learning as well as various programme carried out to look out the impact and effectiveness on the various selected topics using the Vedic mathematics in the Indian region.
2.7 Critical Analysis of Related Researches

In order to decide the objectives, sample, method of data collection, data analysis, the researcher had to study past studies. In the present study total fifteen related past studies according to the objectives of the study were reviewed.

Trend

The reviewed researches were analysed in terms of time period and found that the foreign studies and studies in India were conducted during the year 1970 to 2010 as the present available sources, Out of fifteen total researches, only one research conducted during the year 1961-1970 as the present available sources, no any research related to mathematics at higher level education conducted during the year 1971-1980 as the present available sources, no any research related to mathematics at higher level education conducted during the year 1981-1990 as the present available sources, seven research studies were carried out during the year 2001-2010 as the present available sources. Present research study area of research has been more attracted during the year twenty years 1991 to 2010. Mathematical effectiveness related studies are becomes one of the emerging research area for the present time of education and research era.

Level

Out of fifteen studies, most of the studies were undertaken at Ph.D. level, Dissertation, three to four are research papers. It is also noted that at higher level of Mathematical number of courses and number of students are decrease, Mathematics related studies are very rare in case of research area.
Method of Instruction

The experimental studies are related to trying out the effectiveness of Mathematics related various programs various approach, CAL, CAL, conventional method, structural approach. In survey most of the researches are concerned with teachers’ and students’ perceptions and opinionnaire of Mathematical related studies. Most of the studies are undertaken by the experimental design of the research. Vedic mathematics is the ancient system of the India and very few of the research are carried out to see the effectiveness of Vedic Mathematics with reference to various selected Methods.

Variables

Out of Fifteen studies, thirteen studies were undertaken under experimental and two studies as survey type. Traditional method and Conventional method were taken as independent variables while achievement in Mathematics with reference to various selected topic on mathematics related CAI, CAL and Various Mathematics related programs was taken as dependent variables.

Programmes

A well structured course with carefully sequenced activities was tried out, lesson plans based on Mathematics, various selected topic on mathematics related CAI, CAL and Various Mathematics related programme to develop speed accuracy, competence and lesson plans were developed by the researchers.

Sample

School students, student-teachers, teachers and administers were taken as the sample for the study. In most of the studies school students were taken as the sample. In the experimental research the sample size ranges from 25 to 200 students. In survey research, students were taken as the sample. Studies are conducted at primary,
secondary, higher and college level. In experimental studies, random, purposive, cluster and probability sampling were used while random, purposive sampling techniques were used in survey studies.

**Research Design**

In experimental research, pre-test, post-test, pre-test post-test control group design, equal group post-test only design, pre-test post-test non-equivalent group design and post-test quasi-experimental design were used.

**Time of Experiment**

The time of experiment ranges from 20 days to 6 month.

**Tool**

In experimental design teacher made test and opinionnaire was used in studies. In survey, questionnaire, interview, observations, schedule interaction analysis, scholastic achievement, opinionnaire were used for collection of data. Rating Scale and mathematical skill related self-confidence rating scale were also administrated.

**Tool for Achievement**

Teacher made achievement test was used in English in experimental research.

**Statistical Techniques for Data Analysis**

In experimental studies, majority t-test was used in studies, mean and SD, ANCOVA and Mann-Whitney U-test technique were used for data analysis. In survey studies, mean, SD, F-ratio, frequency, percentage, adopted analytic induction, were used.

**2.8 Significance of the Study**

The present study is found sound on the basis of the following reasons:

1. It can be inferred that majority of the studies have indicated that teaching through Mathematics is effective in terms of students’ academic achievement
and it helps in increasing conceptual understanding. Moreover, it was found that students could learn at own pace and they could get constant feedback which especially helped the weaker students. Thus, Vedic techniques seem to be playing an increasingly vital role in the classroom instructional process. Teaching through Vedic techniques has been found to be effective, not only for academic achievement but also for some other aspects like accuracy, speed, interest and attitude.

2. Most of the past studies have two methods of independent variables. The present study is on two techniques of independent variables that is Vedic and Conventional Techniques.

3. The content matter selected by previous researchers was lexical. Not a single study has been found on textbook. The present study is based on teaching Mathematics using present textbook of GSEB, Gandhinagar that is the main distinguishing feature of the present study.

4. In the previous study no single study is found on Gujarat State in Mathematics of text book lessons of GSEB, Gandhinagar.

5. The programme was implemented in the classroom to evaluate its effectiveness in terms of academic achievement of learners. Although in such students one can follow single group pre post and post test design to study the effectiveness of other methods and techniques, but in this study since the focus of the study was to see effectiveness of methods and techniques in terms of academic achievement of learners, it was decided to take only post test in control and experimental group design.

6. This helped the researcher to compare the effectiveness of teaching through Vedic Mathematical Techniques over teaching through Conventional
Mathematical Techniques. Subsequently, the qualitative data related to the opinion of students regarding the developed and implemented Vedic programme were collected through the Interest Inventory. In the present study, it was also decided to study how learning through Vedic Techniques was more interesting and helpful to the learners.

2.9 Conclusion

The review of past studies helped the researcher to develop insight for working out the methodology and design of the programme for the present study and carrying out the investigation on scientific lines. These aspects are presented in the next chapter in detail.
End notes


ii ibid, P. 60.


xvii M. Vanaja, Research Methodology, Surya Pub., New Delhi, 2003, P. 34.