Chapter 2

REVIEW OF RELATED LITERATURE
CHAPTER II

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2.1 INTRODUCTION

In a systematic research study, review of literature has an active role. Any research study is born out of the consolidation of a host of knowledge, already gathered by various researchers in the particular field. Familiarity with the studies in the area of research and available literature is also essential for making new grounds and for the proper planning and designing of the study. Review of related literature helps in the selection of the problem and to gather up-to-date information about what has been done in the particular area in which a researcher intends to make his study.

2.2 IMPORTANCE OF REVIEW OF RELATED LITERATURE

A brief summary of previous research and the writings of recognized experts provide evidence that the researcher is familiar with what is already known and with what is still unknown and untested. Since effective research must be based upon the past knowledge, this step helps to eliminate the duplication of what has been done before.

The first task of the investigator is to decide on a specific problem for investigation. After the selection of a problem for the study, related literature helps to define and delimit the problem. Review of related literature leads the investigator into the formulation of a hypotheses. The theoretical framework of the entire study is developed using related literature. It helps the investigator to identify the dependent and independent variables. Through a review of related literature the investigator is able to select appropriate tools to be employed in the collection of data and the proper methods for the interpretation of results.
Review of related literature is indispensable as it provides helpful suggestions for further research work. Without a review of related literature, it will not be possible to proceed with the research work with a firm ground and justification. With this motive in view, a review of previous studies in the relevant area of the present study has been attempted and presented in this chapter.

The Review of literature related to this research work has been classified under the following heads:

(i) Studies on mathematics teaching
(ii) Studies on learning mathematics
(iii) Studies on diagnostic test, achievement test and remedial teaching
(iv) Studies on attitude towards learning of Mathematics

2.3. STUDIES ON MATHEMATICS TEACHING

MOHAMMED MIYAN (1982) examined the effectiveness of methods of teaching mathematics in developing mathematical creativity project.

Objectives: (i) To find out the comparative effectiveness of three methods of teaching and learning for developing mathematical creativity in high school students.(ii)To examine whether the methods of teaching had any effect on the development of convergent and divergent thinking components of mathematical creativity.(iii)To assess the effect of methods of teaching on low, medium and high creative students in Mathematics.

Findings: (1) None of the three methods was significantly different in developing mathematical creativity. (2) None of the methods of teaching was found effective in developing fluency and flexibility. (3) The guided discovery methods were not effective in enhancing originality as compared with the tell and do and the pure discovery methods. (4) None of the methods was significantly
different in developing divergent thinking and convergent thinking ability. 

(5) There was no significant effect of the three methods of teaching on any one of the three levels (low, medium, and high) of creative performance in Mathematics.

PRATAP (1982) identified the effectiveness of micro-teaching for development of skills specific to the teaching of modern mathematics. The objectives and findings are given below.

**Objectives:**
(i) To find out whether there were teaching skills specific to the teaching of modern Mathematics at the secondary stage. 
(ii) To find out whether micro-teaching had an advantage over the conventional teaching in developing skills to modern Mathematics. 
(iii) To find out whether the micro-teaching group had superiority over the conventional teaching group in using learnt teaching skills in an integrated form in the normal class room setting. 
(iv) To find out within the conditions of present day schools whether it would be worth while to analyse the models of developing instructional materials and make a rational choice for developing such materials for skill specific to the teaching of modern mathematics.

**Findings:**
(1) Eight skills specific to the teaching of modern mathematics were identified. These skills were skills of developing problem-solving ability, formulating mathematical models, using a black board, handling mathematical instruments, appreciation, analysis, application and performance of mathematical operations. 
(2) Micro-teaching had an advantage over conventional teaching for development of skills specific to teaching of modern mathematics. 
(3) Neither micro-teaching nor conventional teaching had any impact on the attitude of teachers towards teaching. 
(4) The teachers trained through micro-teaching attained a higher level of competence to teach modern mathematics at the secondary stage than those trained through conventional teaching. 
(5) The teachers of the micro-teaching group had a higher level of ability to use the learnt skills in an integrated form in a normal class room setting than the control group.
had. Attempts were made in India to identify the associative factors related to mathematics achievement, apply various instructional methods and strategies and raise the relative and contradictory performance of models of concept attainment.

VAZ., (1982) conducted a study on the devices that can be used to teach modern mathematics in Greater Bombay in standards one to ten.

**Objectives:**
(i) to study the teaching of modern mathematics in schools. (ii) to make a survey schools in Greater Bombay to find out the devices that were used for teaching modern mathematics (iii) to present a study of the uses of some of the principal devices to teach various topics of the syllabus (iv) to design new devices that would meet the needs of schools in India (v) to show how to incorporate activities into the course of normal teaching. (vi) to set forth a plan of a modern Mathematics workshop for the benefit of those schools which were in a position to have one vii to enable the teacher to handle modern mathematics in such a way as to make it a delightful and enriching experience for the students.

**Methodology:** The extensive survey method was employed and purposive sampling was used for the selection of 100 schools. The data were collected by using a questionnaire and through an activity programme. The questionnaire was sent to 100 students in greater Bombay. Responses were received from 93 schools. An activity programme was conducted by the researches. The programmes touched all standards from I to X. Twenty seminars were conducted by the author in various parts of Bombay, Pune, Nagpur and the Nilgris. At each seminar, participants prepared teaching aids. In the seminar each teacher submitted one project covering in detail a single topic in the syllabus or one particular type of aid. All the tools used in the study were constructed by the investigator. The data were analyzed by using descriptive statistics.
**Major Findings:** (1) The teachers developed a definite understanding of what Modern Mathematics was. It was the teaching of Mathematics with meaning through a new approach, a new language, and a new content. (2) A knowledge of what was being done and what needed to be done by the teachers of Modern Mathematics in the schools of Greater Bombay was an important finding. A presentation of a vast array of manipulative aids for the teaching of Mathematics along with detailed instructions on how to construct and make use of them, was the final outcome. (3) The study provided a stimulus to teachers of Mathematics to incorporate activities in their day-to-day teaching with the help of simple and readily available materials. (4) It developed skill among teachers to set up and organize an Mathematics workshop. (5) Fifty-one of 93 schools were not in a position to list even five aids that were commonly used by their teachers. (6) Sixteen schools were not able to mention even a single aid.


**Objectives:** (i) To ascertain the comparative effectiveness of the Ausubel strategy with the traditional one of the various criteria of concept acquisition in Mathematics. (ii) To ascertain the comparative effectiveness of the Bruner strategy with the traditional one of the various criteria of concept acquisition in Mathematics. (iii) To ascertain the relative effectiveness of Ausubel and Bruner strategies on the various criteria of concept acquisition in Mathematics. (iv) To ascertain the effectiveness of the Ausubel strategy in the acquisition of concepts in Mathematics separately for the students of different conceptual style preferences. (v) To ascertain the effectiveness of the Bruner strategy in the acquisition of concepts in Mathematics separately for the students of different conceptual style preferences. (vi) To ascertain the relative effectiveness of the Ausubel and Bruner strategy in the acquisition of concepts in Mathematics separately for the students of different conceptual style preferences.
**Methodology:** Twenty five lessons were prepared by each of the three strategies – Ausubel strategy, Bruner strategy and traditional strategy. Lessons of Ausubel strategy followed the operational form of Ausubel’s Advance organizer model lessons of the Bruner strategy followed the operational form of Bruner’s Concept Attaining model.

**Findings:** (1) The Ausubel strategy was superior to the traditional strategy for teaching mathematical concepts to XI grade students, so far as knowledge transfer and heuristic transfer of the concepts were concerned. (2) The Bruner strategy was superior to the traditional strategy for teaching mathematical concepts to XI grade students so far as knowledge, heuristic transfer short term retention and long term retention of the concepts were concerned. (3) Ausubel and Bruner strategies were equally effective for teaching mathematical concepts to XI grade students. (4) The Ausubel strategy was superior to the Bruner strategy for teaching mathematical concepts to XI grade students so far as enhancing concepts transfer was concerned. (5) The Bruner strategy was superior to the Ausubel strategy for teaching mathematical concepts to XI grade students, so far as students ability to transfer heuristics discover new relationships and to refrain knowledge of the concepts learnt for short as well as long periods of time. (6) Conceptual style preference of the students seemed to have a differential effect on their acquisition of mathematical concepts when taught by Ausubel strategy. The strategy appeared to be more suitable for teaching mathematical concepts to categorical style students of the XI grade.

BHALWANKAR (1985) studied the effects of expository and guided discovery methods of teaching Mathematics on the achievement of students of different level of intelligence.

**Objectives:** (i) To study the differential effect of guided discovery and expository methods of teaching Mathematics on the achievement of students. (ii) To compare the effects of guided discovery and expository methods of teaching Mathematics on the achievement of the students of different levels of intelligence.
measured in terms of knowledge comprehension and application objectives. (iii) To compare the effects of guided discovery and expository methods of teaching Mathematics on the retention measured in terms of knowledge comprehension and application objectives with respect to students of different levels of intelligence.

Findings: (1) Guided discovery and expository methods were equally effective on knowledge and comprehension objectives with respect to both immediate post-test as well as retention test. (2) The expository method was more effective than the guide discovery method on the criterion of scores and on application objectives with respect to student of high intelligence. (3) The guided discovery method was more effective than the expository method on the criterion of percentage of retention scores and on the application objective in the case of students of low intelligence. (4) Teachers’ indirect behaviour decreased with the decrease with the decrease in level of intelligence.

The main educational implication of this study is than one cannot be rigid in the use of teaching methods. All teaching methods are effective in certain situations and not so effective in other situations. Content and objectives determine the methods to be used.

CHITKARA, M.(1985) studied the effectiveness of different strategies of teaching on achievement in mathematics in relation to intelligence, sex, and personality.

Objectives: (i) To find out whether achievement in mathematics was affected by different strategies of teaching, (ii) To find whether different strategies had differential effects on achievement of male and female students. (iii) To find whether levels of intelligence interacted with teaching strategies in terms of achievement, and (iv) To find whether personality acted as a potential factor in selection of teaching strategy.
Methodology: In the study a pretest/post-test experimental design was followed. A four-way factorial design (3 x 2 x 2 x 3) was employed. The independent variables in the study included strategies of teaching, sex, personality and intelligence and the criterion variable was achievement in mathematics. The strategies of teaching varied in three ways: (a) lecture-discussion, (b) inductive-drill and (c) auto-instructions group discussion. The personality varied in two ways — extraverts and introverts; the variable of intelligence had three levels — low, average and above average. Extrovert 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). The students were 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 four way (3 x 2 x 2 x 3) analysis of variance.

Findings: (1) All the three strategies, namely, (a) lecture-discussion, (b) inductive-drill, and (c) auto-instruction group discussion, were found to be equally effective in terms 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, was more suited to the students having above average intelligence than average and below - average intelligence. (6) The strategy of lecture-discussions was found to be equally effective with above-average and below –average ability (intelligence) introverts as well as extroverts. (7) Extroverts of high ability, average ability and below average ability scored equally well when taught through strategy 1. (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 extroverts 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 1 was more suited for below – average ability extroverts and introverts, strategy 2 for high ability extroverts and strategy 3 was most suited for high ability introverts for achievement in mathematics.

KAUR, S., (1985) conducted a factorial study on the abstract concepts in different Areas of Mathematics.

Objectives: (i) to study the distribution of the abstract concepts scores of three levels of education in the five areas of mathematics i.e., arithmetic, algebra, geometry, trigonometry, and geometric from perception (ii) to identify the difficulties in the study of Mathematics area wise for the three groups and (iii) to study the dominant factors of Mathematics concepts at three level of education.

Methodology: Five tests were prepared, standardized and administered to 1200 randomly selected students, 400 for each group namely Matric T.D.C (I) Third Year Degree Course Part I and B.Sc., (Final). The composite reliability coefficient of the abstract concept test in Mathematics (ACTM) was estimated by applying the moister formula which came to be 0.94 the construct validity was estimated for all the areas of ACTM.

Major findings: 1) the distribution of scores at the three levels of ACTM deviated from normality 2) the scores in five areas of ACTM were positively skewed and platykurtic at matric level. The distribution of scores in all five areas was negatively skewed and platykurtic at T.D.C (I) level and at B.Sc (Final) level, the distribution was negatively skewed and leptokurtic except in the case of arithmetic where it was platy-kurtic 3) The contrasted group anlaysis revealed that the students belonging to the B.Sc. class excelled in all the five areas of ACTM over the other three groups. 4) The inter correlated study of the five
areas at three levels ACTM showed that Arithmetic, algebra and geometry were prominent and interdependent areas of Mathematics. 5) The results of factor analysis revealed the following: A. In the case of matric students, the highest first factor loadings came against geometric form perception and trigonometry, whereas the highest second factor loadings came against the areas of arithmetic and algebra. These first and second loadings were called “Figure Angular Factor” and “Numerical Facility Factor” respectively. B. In case of TDC (I) students the highest first order factor loading came against algebra and arithmetic these two factors were named as Symbolic Number ability and figure Angular factor respectively. C. In the case of B.Sc., final students the first highest factor loading came against trigonometry and geometry where as the second highest factor leading appeared against arithmetic and algebra. These two factors were made ‘Triangular Figural Relation Ability factor’ and Numerical Ability ‘Factor’ respectively.

RAO, A.V. RAGHAVENDRA,(1986) investigated into the relative effectiveness of guided discovery and expository approaches of teaching mathematics.

Objectives: (i) To study the relative effectiveness of guided discovery and expository approaches of teaching mathematical concepts, (ii) To study the relative effectiveness of guided discovery and expository approaches of teaching problem solving, (iii) To study the interaction of intelligence and achievement in mathematics vis-a-vis guided discovery and expository approaches, and (iv) To study the relative effectiveness of guided discovery and expository approaches in different types of pupils, namely boys, girls and rural pupils.

Hypotheses : (1) There is no significant difference in achievement in mathematics among urban boys when taught by guided discovery and expository approaches. (2) There is no significant difference in achievement in mathematics among rural pupils when taught by guided discovery and expository method. (3) There is no significant difference in problem solving ability among the above categories when taught by expository approaches. (4) Intelligence has no effect
on achievement in mathematics when taught by guided discovery and expository approaches. (5) There is no significant difference in variability among the above categories of pupils when taught by guided discovery and expository approaches.

Methodology: The population selected for testing the above hypotheses was class IX pupils of Vizagapattanam. From this population, three samples namely, boys, girls and rural pupils, were selected. On each sample an intelligence test was administered. Each sample was then divided into two equivalent groups on the basis of their means and SDs on this intelligence test. Thus the two groups were matched for intelligence. After dividing each sample into two equivalent groups, one group was allotted to the guided discovery approach and the other was allotted to the expository approach. Identical topics from arithmetic, algebra and geometry were taught to both the groups for one month. After this a test on these topics was administered to the two groups. The randomized blocks design was based upon the principle of grouping experimental units into blocks. Blocks were formed on the basis of intelligence which was related to achievement in mathematics.

Findings: (1) There was no significant difference in achievement in mathematics when taught by the guided discovery and expository approaches. (2) There was no significant difference in achievement in mathematical concepts when taught by the guided discovery and expository approaches. (3) There was no significant difference in problem solving when taught by the guided discovery and expository approaches, except in the case of girls where a significant difference was found. (4) There was no significant difference in variance in achievement when taught by the guided discovery and expository approaches. (5) Intelligence had no say in achievement when taught by the guided discovery and expository approaches, except in the case of urban boys.
NAGAR. N. (1988) examined the usefulness of computers in teaching Mathematics in his study “Effectiveness of computers in teaching mathematics in schools”.

Problem: The study attempts to ascertain how best a teacher can use the computer to improve learning in the classroom.

Objectives: i. To examine the usefulness of the computer in teaching mathematics, ii. To examine areas / 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.

Methodology: This study is based on a survey of studies, which include, mainly, three projects and ten research studies conducted independently.

Major Findings: 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 a great hindrance in popularizing the use of computer literacy in the educational system, especially at the secondary level of education.
GANGOPADHYAY, TAPAN KAUT (1991) carried out an experimental study of the effectiveness of classroom teaching techniques in relation to students' achievement.

**Objectives:** To find out the effectiveness of four techniques of Teaching-Lecturing (T1), Lecturing and Explanation (T2), Lecturing and Explanation with Questioning – Answering (T3) and Lecturing and Explanation with Questioning – Answering by using feedback (T4) – on the development of knowledge (X1), Comprehension (X2) and application ability (X3) as well as the total achievement (X4) of the pupils in a given teaching–learning situation.

**Methodology:** The pupils studying in class IX were taken as sample for the study, and the content for teaching was selected from history. The sample consisted of 100 students of class IX, divided into four groups, of a Bengali medium school in Howrah, West Bengal. The 15 teaching units were planned in lessons of four types. Technique T4 (lecturing and explanation with questioning – answering by using feedback sequence).

**Finding:** Technique T4 showed more effectiveness than T3, T2 and T1 at the post-test level.

NALAYINI, S. (1991) examined the effectiveness of using number games to teach arithmetic at primary level.

**Problem:** The study centers around using games in teaching arithmetic in primary classes.

**Objectives:** (i) To find the impact of the number games on primary school children in doing mathematical operations, and (ii) to study the relationship between their academic performance and their family background including the economic and educational level of the parents.
Methodology: The sample comprised students of classes I to IV of Kendriya Vidyalaya, Coimbatore. In each class, the experimental group consisted of 50 students and the control group of 25 students. Two similar tests for each standard were developed by the researcher. One was used as the pre-test and the other as the post-test. The mean, SD and ‘t’ test were computed while treating the data.

Major Findings: (1) Among eight comparisons, five comparisons showed significant improvement due to the supplementation of ordinary teaching number games. In the other three comparisons, though the difference was not significant, the means of the experimental groups were higher than the control-group mean. (2) It was also found that neither the educational level nor the economic status of parents influenced the arithmetic growth score of the pupils. (3) Thus it was concluded that number games motivated children to develop the computational skills.

DANDAPANI, C. (1992) explored the various dimensions of effective teaching of mathematics.

Problem: The study identifies the process variables and the characteristics of mathematics teachers which contribute to the effective teaching of mathematics. Further, it builds up a model to identify effective and ineffective teachers.

Objectives: (i) To observe the differences, if any, in the perception of effective teaching of mathematics of teachers with respect to sex, qualification, place of work, type of management of schools, experience, hours of teaching per week, and the type of the school, (ii) to study the factorial structure of the perception of teachers on effective teaching of mathematics, (iii) to identify the dimensions of effective teaching of mathematics based on their perception, (iv) to investigate the relationship between the perception of teachers and the evaluation of headmasters, (v) to evolve a method to identify effective and
ineffective teachers based on the headmasters' evaluation, (vi) to compare the perception of effective and informative teachers on the eleven aspects of effective teaching, and (vii) to construct a mathematical model to classify teachers into effective and ineffective teachers.

**Methodology:** The researcher used the normative survey method. An attempt was made to cover all mathematics teachers working in Tanjore District in Tamil Nadu. There are 374 high and higher secondary schools and 689 mathematics teachers working in these schools. In the pilot study, 31 mathematics teachers and 25 headmasters of 25 schools participated. In the final study, 375 mathematics teachers from 162 schools participated, and 162 headmasters evaluated their mathematics teachers. The tools used to collect data developed by the investigator included a Teachers' Perception Scale of Effective Teaching of Mathematics and characteristics of Effective mathematics Teachers Description form. The collected data were treated with mean, SD, 't' test, 'F' test and chi-square.

**Major Findings:** (1) Female teachers had a significantly higher perception than the male teachers, (2) Teachers' perception had been found to vary with their years of experience. This variation was found to exist on all the eleven aspects of effective teaching. (3) The perception of teachers did not differ because of their qualifications (both academic and professional), place of work, viz rural and urban, type of management, type of school and number of periods / week of teaching mathematics. (4) Factorial analysis had revealed the existence of two factors accounting for 50% of the variance. Factor I consisted of the five aspects of effective teaching mathematics. There were six aspects in Factor II of the effective teaching of mathematics. (5) Teachers’ perception had been significantly related to their headmasters’ evaluation, and, consequently to their characteristics (Chi-square). (7) The effective teachers differed significantly from the ineffective teachers on all the eleven aspects of teaching.
SINGH, R.D. (1992) identified the relative merits of teaching Mathematics through computer-assisted-instruction and conventional methods of teaching on cognitive and non-cognitive variables.

**Problem:** The present study aims to compare the results of computer assisted instruction (CAI) with the results of the conventional method of instruction in teaching mathematics in certain selected units of the mathematics curriculum.

**Objectives:** (i) To compare the results of the two groups in mathematical achievement, (ii) to compare the results of the two groups in mathematical achievement sex-wise, and (iii) to compare the attitudes towards mathematics of the two groups as whole, and also sex-wise.

**Methodology:** The study was conducted in four higher secondary schools having facilities of three to five BBC micro computers. The students belonged to different socio-economic groups. Three units of the mathematics syllabus for class IX, namely, simultaneously equations in algebra, statistical data and their graphical representation in statistics, and triangles and their congruencies in geometry were chosen for the study. The tools used in the study included Rating Scale by the researcher, General Intelligence Test of Mohsin, the attitude Scale towards Mathematics of Suydam, and the Educational Software prepared by the practising teachers. The statistical techniques used included, mean, SD, and ‘t’ test.

**Major Findings:** (1) The groups taught through CAI in all the schools showed a substantial progress. (2) The gains in achievement of the pupils of good schools are higher than those of pupils of average and poor schools. (3) The CAI method of teaching mathematics had proved to be more effective. (4) Both boys and girls gained more from the computer treatment. (5) A significant favourable change in the attitude of the pupils of the experimental groups over
the control groups was observed. (6) The change in attitude towards mathematics was independent of gender.

PRABHA, RASHMI (1992) made an investigation into the effectiveness of programmed mathematics in relation to some socio-academic variables.

Problem: The study seeks to study the relationship between achievement in mathematics through programmed text and through the traditional method of teaching mathematics.

Objectives: (i) To compare learning through programmed text in mathematics and through traditional teaching, (ii) to see whether the mother’s education affects achievement through programmed text, (iii) to see whether the father’s education affects learning through programmed text, (iv) to see whether parental profession affects achievement through programmed text, (v) to see whether parental income affects achievement through programmed text, (vi) to compare previous achievement and achievement through programmed text.

Methodology: The sample consisted of 217 secondary final year students studying in two randomly selected schools of Patna. The control group consisted of 113 students and the experimental group consisted of 104 students. A critical test was used for collection of data. The statistical technique applied were mean, SD, analysis of variance and ‘t’ test.

Major Findings: (1) The programmed text group performed significantly better than the traditional-method group. (2) The programmed text group were found to be significantly better than the traditional-method group. (3) The mother’s education significantly affected achievement in mathematics through programmed text. (4) The father’s education significantly affected achievement in mathematics through programmed text (5) The mother’s profession significantly affected achievement in mathematics through programmed text (6) The father’s profession significantly affected achievement in mathematics.
through programmed text (7) Parental income significantly affected achievement in mathematics through programmed text (8) caste significantly affected achievement in mathematics through programmed text (9) The previous achievement level had no role to play in learning through programmed text.

MALLAPURMATH, T.C. (1995) identified the effectiveness of developmental model in teaching geometrical theorems on development of higher cognitive abilities and achievement among class IX pupils.

Objectives: i. To compare the effectiveness of developmental and traditional models of teaching geometrical theorems in developing inducto-deductive, analytico-synthetic, and achievement among Class IX pupils. ii to investigate the interaction between ‘treatments’ and ‘levels of pupils’ with reference to achievement; and iii. To investigate if pupils retain inducto-deductive reasoning abilities, analytico-synthetic reasoning abilities, and achievement gained through developmental model of teaching, test, and achievement test. Statistical tests used to interpret the data were mean, S.D., ‘t’ test, two-way analysis of variance, and Scheffe’s test.

Findings: (1) Developmental model of teaching geometrical theorems is more effective than the traditional model not only in developing inducto-deductive and analytico-synthetic reasoning abilities, but also in promoting achievement of Class IX

AGARKAR, SUDHAKAR C. (1997) conducted a programme to improve teaching of science and mathematics in rural secondary schools.

Problem: This study outlines the design, salient findings and implications of the programme to improve teaching of science and mathematics in rural secondary schools.
Objectives: (i) To outline the design of a three-year project undertaken in one of the rural blocks of the state of Maharashtra by the Homi Bhabha Centre for Science Education (HBCSE), the Education Department and the Directorate of Tribal Development, Government of Maharashtra for the development of a strategy for in-service training of science and mathematics teachers, and (ii) To find out the effectiveness of the programme in terms of change in teachers’ classroom behaviour and student’s performance.

Methodology: The programme envisaged intensive interaction with teachers teaching science and mathematics. A five-day training course per academic term was arranged as a part of this programme in a rural block consisting of 17 secondary schools catering to about four thousand students studying in classes VIII, IX, and X. A few practising teachers were interviewed before the commencement of the project. Taking into account these expectations and demands placed by secondary level curriculum orientation, courses were planned. Teachers’ classroom behaviour was assessed using a specifically developed tool by Agarkar. The performance of the project schools in S.S.C. examinations before and after the project was compared to find out changes in the performance of students.

Major Findings: (1) The major components of the inservice training for science and mathematics teachers were content sessions, pedagogy sessions, and laboratory sessions. (2) School visits were found to play an important role in changing teachers’ style of teaching. Efforts were made to keep regular contacts with the teachers through bimonthly visits to all the schools in the project. (3) There was a change in the teachers’ classroom behaviour after the programme. Most of the headmasters reported positive changes in the use of school laboratory, teachers’ awareness towards linguistic difficulties of students and pupil participation in classroom deliberations. (4) The percentage of student failures dropped by about 10% and the percentage of students securing first class increased by about 8%.
CHEL, M.M. (1997) did research on ‘Seeing is believing’ principles in teaching mathematics at the secondary level.

**Problem:** The study attempts to examine the effectiveness of ‘Seeing is believing’ principles in teaching mathematics at the secondary level via pilot study mode.

**Objective:** To test the efficacy of teaching mathematics through ‘seeing is believing principle’.

**Methodology:** The sample consisted of 289 students of class VI, VII and VIII of two co-educational schools including one rural and one urban areas. Two groups were formed out of which one was taught by the conventional method and the other was taught using the principles of experimentation by the same teacher. After the teaching, unit test was conducted for the students of both the groups. The collected data were treated with mean and standard deviation.

**Major finding:** The efficacy of teaching mathematics through experimentation was better than ordinary or conventional method of teaching.

SURESH, THILAKA & PRAMILA, K.S.(2000) studied the use of computer multimedia program in learning trigonometry among high school students.

**Objectives:** (i) To find out the influence of computer based multimedia program on the achievement in mathematics among high school students. (ii) To study the change in their attitude towards mathematics after learning trigonometry through computer based multimedia and text based self-study material. (iii) To find out the significant difference in achievement in mathematics between high achievers and low achievers from both the experimental and control groups. (iv) To find out the relative retention of learning in mathematics between the experimental and the control groups.
Major findings: 1. There is no influence of computer based multimedia program on the achievement in Mathematics among 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 the experimental and control groups. 4. There is no significant difference in the retention of learning in mathematics between the experimental group and control group.

COLE, DONNA SUE (2000) conducted a study to determine the effects of a spiral mathematics method of instruction on fifth and sixth grade achievement as measured by the Texas Assessment of Academic Skills (TAAS) test.

Objectives: To design and determine the effects of the spiral mathematics method of instruction on fifth and sixth grade achievement as measured by the TAAS test.

Methodology: An ex-post-facto-design was used to analyze achievement data in Mathematics on the TAAS tests. Longitudinal TAAS data was analyzed for sixty-six fifth grade students in year (1994-1995) and the identical sixty-six sixth students in year two (1995-1996).

Research Questions: (1) Do stratified randomly assigned fifth grade classes instructed in the spiral method instruction have higher mathematics achievement than those instructed in a non-spiral method during the first year of instruction? (2) Do stratified randomly assigned fifth and sixth grade classes instructed in the spiral method of instruction have higher mathematics achievement than those instructed in a non-spiral method during second year of instruction?

Findings: 1. There is no significant difference (p < 0.05) between the TAAS test scores of fifth grade mathematics students receiving the spiral method
of instruction and those receiving the non-spiral method of instruction during the first year. 2. There is a statistically significant difference between the spiral and non-spiral method of Mathematical instruction on mathematics achievement assessments. 2. There is no significant difference (P<0.05) between the TAAS test scores of sixth grade mathematics students receiving the spiral method of instruction and those who receiving the non-spiral method of instruction during the second year. 3. There is no significant difference (p<0.05) between the fifth grade spiral method of instruction (treatment group) and the sixth grade spiral method of instruction (treatment group) on mathematics achievement as indicated on the mathematics portion of the TAAS test. 4. There is no significant difference (p<0.05) between the fifth grade non-spiral method of instruction (control group) on mathematics achievement as indicated on the mathematics portion of the TAAS test.

The results of achievement gains on the sixth grade TAAS tests support the spiral method (treatment group) compared to the baseline year (1994-1995) at p<0.001 level of confidence. The results showed an increase from 77% mastery to 85% mastery between the baseline year and the year two for the treatment group. The results of achievement gains on the fifth grade TAAS tests support the non-spiral method (control group) during the baseline year (1994-1995) at p<0.001 level of confidence. During year two (1995-1996) the results of achievement gains on the sixth grade do not support the non-spiral method (control group) at p<0.05 level of confidence and shows a decrease from 86% mastery to 83% mastery. The three null hypotheses were rejected at the p<0.05 level of confidence based on the Wilcoxon Matched – Pair Signed – Ranks test.

LUONGO, CAROL ANN (2001) made two case studies on problem-solving skills and their presentation in daily classroom mathematics instruction

**Problem:** The purpose of this study was to explore the connections between a teacher’s mental model for instruction, a set of instructional strategies that represent that model, and responsive student learning strategies that may or
may not be cued to the instruction of the teacher. It is possible that teachers miscue students when their mental constructions of instructional acts reinforce the wrong set of strategies for a particular problem.

**Objectives:** The research explored the following questions: (i) What happens when the teacher presentation model is inconsistent with the evaluation model? (ii) What happens when the teachers presentation model is inconsistent with students performance model? (iii) What happens when the teachers evaluation model is inconsistent with the mathematical problems children are required to solve? What happens when there is a mismatch between teacher instruction and task demands of the problem? (iv) can teachers be taught to monitor mismatches and become reflective practitioners? (v) Can educators benefit from the feedback that describes mismatches between student performance and teacher presentation, between student performance and teacher evaluation, and teacher performance and problem type? (vi) Can educators improve the instructional environment for children for correcting mismatches?

**Methodology:** The student sample consisted of two groups of ten students of average mathematical ability selected from a regular fourth grade classroom located in a suburban middle to high-income school district. The two teachers in the study had different instructional approaches, which were the traditional approach and an approach that combined the traditional approach with the heuristic approach. One problem type was selected for the teacher presentation. The data collected was compared and contrasted to discover matches/mismatches and consistencies/inconsistencies among all three components of the study.

**Findings:** The results of the study indicated that 1. Both teachers employed similar evaluation models. 2. The students appeared to understand the relationship between the problem type and solution strategy regardless of the instructional approach. 3. What was important to the students was that the teachers clearly explained the lesson, answered their questions and instilled confidence. 4. The matches/mismatches between the problem type, evaluation
model and / or instructional approach did not appear to affect the students perception of understanding the problem.


**Objectives:** (i) To analyse the traditional approach and Content cum-methodology (CCM) Approach of teaching Mathematics; and (ii) to plan, design, construct and test instructional system for teaching of Mathematics.

**Methodology:** The sample consisted of 120 students studying in Class VIII, 30 pupil-teachers and 2 colleges of education were selected from Sangli and Ichalkaranji cities. Tools like questionnaire, achievement test for pupil teachers and students, retention test, interview schedule and lesson observation rating scale were used for data collection. The collected data was analysed using ‘t’ test.

**Findings:** (1) Instructional system for Mathematics developed under the study was more effective than conventional instructional system for both students and pupil teachers. (2) The male pupil-teachers and female pupil teacher performed differently under both instructional system. (3) Similarly male and female students differed in their performance under both instructional systems. The study has 53 references.

ENDO, SAYAKO. (2001) studied the comparative effects of three subjects of the teaching examples on generalized arithmetic story problem-solving by first grade students.

**Objectives:** (i)The purpose of this study was to explore if there were any differential effects of selected teaching examples on the generalization of story problem solving skills, (ii) To explore what kind of teaching examples would promote the most generalizations.
Methodology: Fifteen students in the first grade were divided into three groups and taught the following three different subsets of teaching examples. M C S P problems contained six teaching examples that sampled all three categories (combination, change and comparison) but that sampled only one type of mystery box equations. S C M P problems contained six teaching examples that sampled only one category (change) but that sampled all 6 types of mystery box equations. The three subsets of teaching examples were taught through the instruction featuring the mystery box strategy, choral responding and responses cards.

As results of the study MCMP problems produced the most generalization of story problem solving on answers and equations of taught problems. Because the MCMP problems were complicated the students needed more instructional time for acquisition of those problems as compared with M C S P and SCMP problems. However, students were able to achieve more than 50% correct on answers and equations only after they had received MCMP instruction. Moreover, the more instructions that students received on MCMP problems, the more generalization they exhibited.

A sample consisted of two matched groups each of 30 students of class IX selected on the basis of Standard Progressive Matrices test. The two groups were randomly selected as the control and the experimental groups. The tools used for collecting the data were Inducto-deductive reasoning test, analytico-synthetic reasoning pupils belonging to above-average, average, and below-average groups.

Findings: (1) There is no significant interaction between ‘treatment’ and ‘levels’ with reference to pupil’s achievement. (2) Pupils retained inducto-deductive reasoning abilities, analytico-synthetic reasoning abilities, and achievement gained through developmental model of teaching the geometrical theorems.
HODGES, ROSEMARY. (2001) did research on computer-aided instruction compared to a traditional method of teaching fractions in elementary mathematics.

The purpose of this study was to compare student achievement in mathematics on the concept of fractions. The students in the two groups were from an urban area. The research question that guided the study, theorized that students using computer-aided-instruction and the traditional method would not demonstrate significant differences in mathematics achievement.

Objectives: (i) To determine, by use of paired t-test whether or not each of the two teaching methods significantly affect the scores in Mathematics. (ii) To directly compare the computer-aided-instruction to traditional instruction and compare the results on the concept of fractions. (iii) to compare male/female results within each teaching method on the concept of fractions and (iv) to compare African American males/white males results within each teaching method on the concept of fractions.

Methodology: The researcher gathered data and analyzed student achievement by administering the California Achievement test to the two groups as a pre and post assessment. Stat view by SAS Institute, Inc. was used to analyze data for this study. Unpaired t-analysis and Man-cora were used to generate the comparative data.

Findings: (1) The results of the study revealed that no significant difference was found in achievement between the two groups or between the group means. (2) When directly comparing computer-aided-instructions to traditional instruction when teaching fractions, no significant difference was found between the two teaching methods or between the two group means (3) In comparison of male/female results within each teaching method on the concept of fractions, no significant difference was found in the pre or post-test. (4) There
was a significant difference between African-American males and white males in the experimental group with fraction gains, but no significant difference found in the control group. (5) No significant difference was found in the pretest of fraction in either group. A significant difference was determined in the post-test of the control group and no significant difference was found within the experimental group.

ATHIPEN, C. PREM (2002) conducted a study on the impact of using simple techniques in mental arithmetic.

Objectives: (i) To find out the effect of teaching simple techniques and practice of mental arithmetic on the pupils of class VI; and (ii) To compare the speed and accuracy in doing mental arithmetic in the pre-test and post-test among boys, girls, rural, urban and the entire sample.

Methodology: The sample consisted of 14 boys and 19 girls of class VI in Government Middle School in Nagercoil town. Two question papers of equal standard were prepared by the researcher to conduct the pre-test and post-test. The question paper contained 10 questions on addition and 10 questions on multiplication, based on prescribed syllabus for class VI in Tamil Nadu. Pupils were compelled to do the necessary calculations mentally and without any paper work. Mean, SD and t-value were determined to analyse the data.

Findings: (1) The use of simple techniques in mental arithmetic had increased the speed and accuracy of VI standard pupils. (2) There was no significant difference either among boys and girls or among rural and urban pupils in the speed and accuracy in doing mental arithmetic. The study has no reference.

Objectives: The purpose of this study was to compare the palmetto Achievement Challenge Test (PACT) scores for mathematics and English language arts of self-contained classroom students and team-taught students to determine if significant differences existed in the academic achievement of the two groups.

Methodology: The study employed the statistical package for the Social Sciences Series Ten (SPSS – X) to analyze the data. Descriptive statistical (mean, mode, median, Standard deviations etc.) were employed to generate descriptive findings. The t-test for independent means, the Analysis of Covariance, the one way Analysis of Variance and the Newman-Keuls. Multiple Range Tests were employed to generate the comparative findings.

Major findings: (1) There was a strong significant difference in math achievement between students taught in self-contained class rooms and students taught by a team of teachers. (2) There was no significant difference in language arts achievement between students taught in self-contained class-rooms and students taught by a team of teachers based on gender, race and socio-economics.

MORRIES, KATHLEEN MARIE (2002) studied the effects of mathematic curriculum materials and instruction on the achievement and conceptual understanding of sixth grade students.

Problem: In the 1980’s and 1990’s the release of a ‘A Nation at Risk’ and the results of the Third International Mathematics and Science Study (TIMSS) and the National Assessment of Educational Progress (NAEP) raised the level of concern about student achievement in Mathematics in the U.S. The mathematics education research Community responded with the development of standards-based text books at all levels K-12, that provide research – based instructional support for teachers.

Objectives: (i).To conduct a rigorous analysis of middle grades mathematics text books, including four standards-based curriculum materials and
nine traditional text books. (ii). To analyse, based on six basic mathematics learning goals, and (iii). to examine thirteen middle grades textbooks for the support of teachers in using research-based instructional strategies resulting in high ratings for the standards-based text books.

Methodology: This study as a pilot to a larger study, examined teacher behaviour and fidelity of implementation of the two of the highly-rated standards-based text books in sixth grade, and student achievement outcomes based on district standardized test data to explore what happens with the standards-based text books in the hands of teachers in typical classrooms. Data about teacher background and experience were gathered from interviews and questionnaires. Class room observations were coded using a specially designed analysis tool. Student test data from the observed classes and from demographically matched schools in the district were analyzed to determine if students in classes using the standards-based text books demonstrated better achievement than students in classes using traditional text books.

Findings: 1. There was no significant difference between the achievement scores of students in the standards-based class rooms and those in traditional class rooms when analyzed by group. 2. When analyzed by school, students in one standards-based school scored about the same as those in matched traditional schools, while students in the second standards-based school posted lower scores than those in all of the other schools. 3. Even when highly rated textbooks are implemented with fidelity, student achievement may not surpass that of similar groups of students using low-rated text books after one year.

A longitudinal study is now in process that builds on this pilot study, focusing on specific learning goals, and including carefully designed pre-and post-tests and an extensive professional development component.
YOUNG, CYNTIA TYLER (2002) studied the rapid acceleration of fourth grade skill mastery using low stress algorithms with particular reference to the Addition and multiplication of whole numbers.

Objectives: To examine the effectiveness of an alternative approach to teaching whole number addition and multiplication as compared to a conventional text-book – based approach.

Methodology: Two teachers (one per group) and 84 fourth – grade students were randomly assigned to either the experimental group (21 in each of two classes). The experimental teacher taught the alternative procedure, a low-strange full-record algorithmic approach, and the control teacher taught a more conventional procedure, a textbook-based approach. Difficulty of achievement test was based on state standards; teachers were allowed to test when they felt a reasonable proficiency has occurred. The results were examined in terms of student attitude student achievement and student rate of learning.

Findings: 1. Students in the experimental group demonstrated a higher level mastery, with the treatment group reaching proficiency in less than one-third of the time required by the control group. These differences were statistically significant for both an immediate achievement test and a retention test. 2. Similar differences were found for student attitude as well. Explanations for the superiority of the alternative procedure in explored and implications for the teaching of elementary school mathematics are offered.

2.4. SYNTHESIS OF STUDIES ON MATHEMATICS TEACHING

On reviewing the related research work done on the teaching of Mathematics it is found that Mohammed Miyan (1982) examined the effectiveness of the methods of teaching mathematics in developing mathematical creativity project. Pratap (1982) identified the effectiveness of micro–teaching for the development of skills specific to the teaching of modern
mathematics. Vaz (1982) conducted a study on the devices that can be used to teach modern Mathematics, to design new devices that would meet the needs of schools in India and to show how to incorporate activities into the course of normal teaching. Kaur S. (1985) made a factorial study of the distribution of the abstract concepts in different areas of Mathematics. Chitriv (1983) ascertained the comparative effectiveness of Ausubel and Bruner strategies with the traditional one for acquisition of concept in Mathematics. The study conducted by Chitkara M. (1985) revealed the effectiveness of different strategies of teaching on achievement in mathematics in relation to intelligence, sex and personality. Bhalwankar (1985) studied the effects of expository and guided discovery methods of teaching mathematics on the achievement of students of different level of intelligence. Rao, Raghavendra A.V. (1986) made an investigation into the relative effectiveness of guided discovery and expository approaches of teaching mathematics. Nagar N. (1989) presented a survey report of three projects and ten research studies carried out in other countries and the status of computer aided teaching of mathematics and concludes that mathematics can be taught more effectively through computers. Gangopadhyay, Tapan Kaut (1991) carried out an experimental study of the effectiveness of classroom teaching techniques in relation to students' achievement to find out the effectiveness of four techniques of teaching on the development of knowledge comprehension and application ability as well as the total achievement and concludes that the fourth technique (T4) — (lecturing and explanation with questioning answering by using feed back sequence) was more effective than T3, T2, and T1. Nalayini, S. (1991) examined the effectiveness of using number games to teach arithmetic. Dandapani C. (1992) identified the process variables and the characteristics of mathematics teachers which contribute to the effective teaching of mathematics. Further, it builds up a model to identify effective and ineffective teachers. Prabha, Rashmi. (1992) studied the relationship between achievement in mathematics through programmed text and through programmed text and through the traditional method of teaching mathematics. Singh, R.D. (1992) discussed the relative merits of teaching mathematics through computer-
assisted – instruction as compared to conventional methods of teaching. Mallaperumath, T.C. 1995. studied the effectiveness of developmental model in teaching geometrical theorems on development of higher cognitive abilities and achievement among class IX pupils. Agarkar, Sudhakar C. (1997) made a study outlining the design, salient findings and implications of the three year project programme to improve teaching of science and mathematics in rural secondary schools.

multiplication as compared to a conventional text book based approach. The results were examined in terms of student attitude, student achievement, and student rate of learning.

2.5. STUDIES ON LEARNING MATHEMATICS


Objectives: (i) to find out the efficiency of the programmed learning method over the conventional learning method in the instruction of mathematics in school education, (ii) to determine the variation in learning gains in the pupils in the rural – urban dimension, (iii) to determine whether there was any difference in learning due to sex variation of the pupils, (iv) to investigate into the variations in achievement gains of the pupils in mathematics owing to variations in their general mental ability level under programmed learning instruction, and (v) to find out the differential learning gains in the pupils owing to school climate, with special reference to private and government management of institutions.

Methodology: The design was an experimental cum field investigation. Two matched groups of students were exposed to programmed learning and conventional classroom teaching. The subjects were matched on the rural urban variable, sex, IQ, stage of instruction and management of schools. A sample of 300 students from grade V and 296 students from grade X was taken. Equal numbers of students were assigned to the programmed learning group and conventional learning group in both grades. The tools employed for data collection were The Hyderabad State Bureau of Education group Test of Intelligence (1980), an interview schedule to know the attitude of students, and achievement tests in mathematics for students of grades V and X.

Findings: 1. The mean performance scores of the programmed learning group and conventional group on the achievement test were less than the
normative means of the tests. 2. The mean performance scores of all the programmed learning groups were higher than those of the corresponding conventional learning groups. 3. The performance of urban subjects was superior to the performance of the rural subjects was superior to the performance of the rural subjects under the programmed learning method, irrespective of grade. 4. The difference between the mean performance scores of the programmed learning and conventional learning groups was the highest in the case of urban subjects of grade X. 5. In grades V and X, girls scored higher than boys. 6. There existed no sex difference in the learning gains of the programmed learning groups separated on the basis of sex. 7. The mean performance scores of groups of subjects of high, average and low level of general mental ability were in the order of their categorization. 8. The significant differences were very high in the case of mean performance scores of the programmed learning and conventional learning groups of subjects in the category of high level of general mental ability. 9. Subjects of grade X gained more by the programmed learning method than subjects of grade V. 10. The increase in mean performance score of subjects of private schools was more by the programmed learning method of instruction as compared to that of government schools. 11. The difference between mean performance scores of the programmed learning and conventional groups was the highest in the case of the subjects of grade V of private schools. 12. The learning gains in mathematics were maximized by the programmed learning method in the case of subjects of urban private schools. 13. The girls of the private schools, irrespective of their stage of instruction, scored higher than the boys by the programmed learning method of instruction scored higher than the boys by the programmed learning method of instruction in mathematics, though these differences were not found to be significant. 14. Subjects of high general mental ability of private schools were the highest beneficiaries of the programmed learning method of instruction in mathematics.

VYAS, C.S.(1983) did research on the development of symbol picture logic programme and to study its effect on mathematics achievement.
Objectives: (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.

Methodology: The symbol picture logic programme was developed keeping in mind the basic element of logic to be included in the programme and the basic connectives in logic. For selecting 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. There were 160 students in the experimental group and 160 students in the control group. Four schools were selected at random from 16 schools of Bayad taluka. The other tool that was used for collecting data was the Group Test of Intelligence by K.G. Desai. The 2 x 2 x 2 factorial design was adopted for studying the SPLP in relation to achievement, parent's education and sex. Analysis of variance technique was used for analyzing the data. The experiment was carried out on students of class IX.

Findings: 1. The students of the experimental group who were given a treatment of the SPLP showed better achievement in mathematics than the control group students. 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. This showed that the achievement in mathematics was independent of these three variables. 7. The students of the control group possessing low general ability and low syllogistic reasoning were inferior to the students of the rest of the group. 8. The students of the experimental group possessing high intelligence and high reasoning did better in achievement. In mathematics than the students of the control group possessing low intelligence and low reasoning ability. 9. There was no significant mean difference in achievement in mathematics of students whose parents’ education was high and those whose parents’ education was low. 10. There was no interaction effect between the programme and parent’s education. 11. The students choosing higher mathematics course did better in mathematics achievement after taking the SPLP than the students who chose commercial arithmetic. 12. There was no interaction between the programme and the choice of course. 13. There was no significant difference between the means of achievement in mathematics of boys and girls taking the SPLP, and also there was no significant difference between the means of achievement in mathematics of boys and girls who did not take the SPLP.

The study implied that the mathematics teacher could use the symbol picture logic programme in secondary schools to make students active participants in the thinking process, to cultivate the students’ ability of logical thinking spontaneously, to motivate students to comprehend a symbolic strategy rather than rote learning of figurative rules, and to help students to visualize the explicit meaning of symbolic expression first and then to verbalize.

SANKARA NARAYANAN, B.L.(1990) analysed achievement in mathematics under guided discovery learning and reception learning conditions.

Problem: This study addresses the problem of achievement in mathematics under guided discovery learning and reception learning conditions in relation to intelligence and anxiety.
Objectives: (i) To test the main effects of two modes of instructional presentation, two levels of intelligence (high average) and two levels of the trait anxiety, (high and low) on students’ immediate and delayed retention, immediate and delayed transfer, as measured by tests of probability, (ii) to test interactions (a) between method of instruction and level of intelligence, (b) between intelligence level and the trait anxiety level, (c) between the trait anxiety level and method of instruction, and (d) among methods of instruction, intelligence level and the trait anxiety level in their effects of student’s retention, (iii) to develop and try out programmed learning material in ‘egru’ and ‘ruleg’ forms as a unit of introduction to probability in mathematics on the basis of the Hermann Model.

Methodology: The subjects were assigned to the two instructional treatments. The tools used in the study were Nafde’s Non-verbal Test of intelligence, a State-Trait Anxiety Inventory, an Achievement Test and an Entering Behaviour Test. The statistical techniques used were a three way analysis of variance.

Major Findings: (1) the girl students taught by the guided-discovery learning method performed significantly better than the girl students taught by the reception-learning method on the six criterion measures – dependent variables. (2) The students of high intelligence performed better than the average intelligence students, irrespective of the method of instruction employed on the criterion measures. (3) The performance of the low-trait variety students was significantly better on measures of delayed achievement and delayed retention, and was significantly better on measures of immediate achievement, retention and delayed transfer, irrespective of methods of instruction employed. (4) There was significant first-order interaction between instructional method and level of intelligence in their effect on the criterion measures, while with the trait, anxiety, it was not significant. (5) There was significant first-order interaction due to intelligence and trait anxiety on all the criterion measures. (6) There was significant second order interaction involving intelligence, trait
anxiety and instructional treatment on all the criterion measures. (7) The girl students of high level intelligence and low level of the trait anxiety, under the guided-discovery learning treatment were found to perform significantly better.

SARANGAPANI, PADMA. M. (1990) did a critique of the primary school mathematics curriculum from a Piagetian perspective.

Problem: This study uses the Piagetian view for analyzing curriculum design and materials. It is then used for a critical evaluation of the NCERT primary mathematics series.

Objectives: (i) To investigate the psychological soundness of mathematics curricula from a Piagetian perspective, (ii) to study the phobia for mathematics in the early primary school years, and (iii) to evaluate critically the National Curriculum Framework of 1988 and mathematics text books.

Methodology: Document analysis was used in the study.

Major Findings: (1) The concepts of specific learning objectives and minimum level of learning put forward by the National Curriculum Framework were found to militate against child-centredness. (2) There was an overall mismatch between the various tasks and objectives prescribed, and the operational level of the age group for which they were meant, e.g. in Class I, where children were mostly in the pre- or transition to the concrete operational stage, almost 80% of the tasks were concrete operational mainly involving large numbers and place value. In class III, where children were still in the early concrete operational stage, over 40% tasks required formal operations and abstract thinking. (3) The strategies for communication were primarily visual, or written, with an emphasis on mathematical terminology. Problems were either numerical computation, or involve situations removed from the child’s reality and did not encourage operativity. (4) The course was ambitious, so that on an average, a teacher would have just one or two periods of 40 minutes each to spend on each new concept. Exercises while in plenty, were mostly a drill in
computation. Thus there was little scope for horizontal elaboration or play. (5) There was virtually no recognition of alternative strategies for assimilation or constructing of concepts. (6) Practically all the concepts had been built on epistemologies shown by Piaget to be invalid. They were sequenced logically rather than psychologically. (7) There was also a high level of algorithmisation which may help children in coping with what has to be learnt, but which will also impede conceptualization, as it rules out the scope of children inventing conceptual links.

BHATIA, KUSUM. (1992) identifies and suggests remedy of difficulties in learning fractions with programmed instructional material.

**Problem:** the present study tests the effectiveness of programmed instructional material as a remedial teaching tool.

**Objectives:** (i) To develop programmed instructional material on fractions fro students of Class V, (ii) to use programmed instructional material as a remedial tool, (iii) to test the effectiveness of programmed instructional material in classroom teaching for students of Class V, and (iv) to test the significance of difference between the traditional method of teaching and teaching through programmed instructional material.

**Methodology:** A sample of 50 students was selected from two M.C.D. primary schools of Karol Bagh, New Delhi(twenty-five students from each school). Four criterion tests were administered as tools to collect data. The collected data were treated by using mean, SD, and t-test.

**Major Findings:** (1) Teaching and learning through programmed instruction could definitely help both students and teachers. (2) Students receiving the programmed instructional material did better in post-test as compared to the other group. (3) The programmed instructional material worked effectively as a remedial tool. (4) Programmed instructional material not only
helped the students to learn better but also helped the teacher to know how the students learn better.


**Problem:** There is a lot of bad teaching in mathematics. Teachers teach mathematics without any emphasis on the taxonomy of the objectives of mathematics. Teachers of mathematics may be made aware of learning outcomes in mathematics.

**Objectives:** (i) To find out the relationship of learning outcomes in mathematics (class X) with intelligence, and socio-economic status, (ii) to find out the relationship between intelligence and learning outcomes after controlling the effect of socio-economic status, (iii) to find out the relationship between socio-economic status and learning outcomes after partialling out the effect of intelligence, and (iv) to compare the learning outcomes in mathematics (objective-wise): (a) of male and female students, (b) of rural and urban students, (c) of science and non-science students, (d) among male students of high, average and low socio-economic status and of high, average and low intelligence, (e) among female students of high, average and low socio-economic status and of high, average and low intelligence.

**Methodology:** The multi-stage random sampling technique was adopted to select the data, making the school as the unit of sampling. Thirty-two schools and 1,030 students were selected at random. The tools used in the study were: An achievement Test in Mathematics, the Socio-economic Status Scale by S.P.Kulshrestha, and the culture Fair Test of Intelligence (Form a) by R.B. Cattell. The Pearson’s co-efficient of correlation, and ‘t’test were used to analyse the data.
Major Findings: (1) Intelligence and SES both were such factors which contributed significantly and positively to the development of learning outcomes in mathematics in terms of knowledge, understanding, application and skill. (2) Female students were better in mathematical knowledge than male students. So far as understanding, application, skill and total learning outcomes in mathematics were concerned, male and female students did not differ. (3) Students who were studying in good schools were better in knowledge, understanding, application, skill and total learning outcomes in mathematics than those studying in bad schools. (4) Students of urban schools showed better gains in all types of learning outcomes in mathematics than students of rural areas. (5) The students of the science group achieved better learning outcomes in mathematics than non-science students. (6) Male students belonging to high SES were better in all the four types of learning outcomes in comparison to low-SES students. (7) Female students who belonged to the high SES group showed higher gain in knowledge, understanding, skill and total achievement in mathematics than low SES female students.

LALITHA BAI, T.K. (1993) made a comprehensive study of the cognitive factor structures of the High Achievers (H.A) Average achievers (A.A) and Low achievers (L.A) in secondary school mathematics.

Problem: The study has been undertaken to compare the cognitive factor structures of the H.A., A.A. and L.A. in secondary school mathematics.

Objectives: (i) To identify the pattern of clustering of 31 cognitive variables for the total sample in terms of the resulting cognitive variables for the total sample in terms of the resulting cognitive factor structures for the three achievement levels in mathematics (HA,AA,LA), and (iii) to compare the differential pattern of clustering of the 31 cognitive variables for the four groups by comparing the cognitive factor structures of the three achievement levels.

Methodology: The sample comprised 531 students of standard X from the Kerala State. The tools used for the study were Achievement Test in
Mathematics, Kerala University Test for Spatial Ability, Kerala University Numerical Ability Test, Kerala Non Verbal Group Test of Intelligence for secondary schools and Kerala University Verbal Group Test of Intelligence. The statistical techniques used for the study were correlation, factor analysis and tests of significance of the difference between means.

Major Findings: (1) 31 Cognitive variables when factor analysed was reduced to a single factor Numerical Ability Factor. (2) Three different kinds of factor structures were obtained for the three different levels. (3) HA-yielded abstract reasoning factor, numerical ability factor, and non-language reasoning factor. (4) AA-yielded numerical perceptual ability, numerical facility factor. (5) The three factor structures of four groups TS, HA, AA and LA indicated that the three factor structures differed from each other in respect of the nature of factors present in each, the degree to which a factor is present in and also in the number of factors present in different structures. The factor structures of the four groups shared a high degree of differentiation of the original group into three differing levels of achievement. (6) The differentiation of a general sample of secondary school pupils into three groups based on three levels of mathematical achievement will result in a parallel differentiation of cognitive factor structures of the three groups when the factor structures have been obtained in terms of a representative group of cognitive variables.

SINHA, KRIPANATH. (1993) made a study of angular method in improving school students’ skill in simple addition.

Problem: This study attempts to examine the role played by angular method in improving school students’ skill in simple addition.

Objectives: (i) To compare the angular method with the traditional method in the achievement of the students in simple addition sums, (ii) To compare the angular method with the traditional method in the development of favourable attitude towards the method learned, and (iii) To compare the angular
method with the traditional method in the development of favourable attitude towards the learning of arithmetic.

**Methodology:** All students of Class VI were selected from two boys, and two girls, schools under the West Bengal Board of Secondary Education in a middle-class suburb in Hooghly District of West Bengal. The tools used to collect the data were a standardized pre-test on previous learning experience in simple addition, a standardized achievement Test, a questionnaire to be used as a pre-test and a questionnaire to be used as a post-test. The collected data were treated with Lindquist’s test.

**Major Findings:** (i) The angular method was more effective than the traditional method for the achievement of the students in simple addition sums. (ii) Both the methods were equally effective for the development of favourable attitudes towards the method learned and towards the learning of arithmetic.

SAXENA, KUSUM.(1998) did research on understanding number 1 to 10 through demonstration.

**Objective:** To make the children understand ordinal numbers and the major differences between cardinal and ordinal numbers in Mathematics in Class II.

**Method:** The sample consisted of 30 Class II B students of D.M. School, Bhopal. Three activities were developed and implemented on children to make them understand cardinal and ordinal numbers. To assess the achievement level of the learners, oral and written test-items were prepared keeping in view bringing each learner to the expected minimum level of competency. The assessment was done through individual activity, i.e. oral activity and written activity. Remedial measures were formulated keeping in mind the individual needs of the learners. Self-learning experiences were provided. Peer-group teaching was performed.
Findings: (1) The number of non-masters was reduced after second short competency-based test. (2) It was found that 80 percent of the students could master the competency and proceeded to the next competency. (3) The remedial measures had helped the non masters to improve the performance during the second test.


Objectives: (i) To identify various learning problems related to arithmetic difficulties. (ii) To identify the types of arithmetic errors and specific error patterns. (iii) To design appropriate intervention teaching techniques. (iv) To compare the performance of the children in English and Oriya medium schools.

Major findings: (1). The performance of students at R-level is far better than their performance at A-level for both Oriya and English medium schools. (2). The performance of students at Cr level is far better than their performance for the corresponding items at R-level in both Oriya and English Medium Schools. Use of concrete materials provides them an opportunity to explore new ideas, find ways of solving problems and mathematical relationships. The sense of accomplishment helps to sustain the interest of the child in mathematics. (3) The performance of students at Ca level is far better than their performance for the corresponding items at A level in both Oriya and English medium schools. Children show improvement if sufficient interactive and concrete experiences necessary for development of basic arithmetical concepts are given to them. (4) The performance of students of (Cr+Ca) levels is far better than their performance in the corresponding items at (R+A) levels in both Oriya and English Medium schools. The findings clearly reveal that actual manipulation of concrete objects is essential for alteration of mental structures and development of concepts. (5) The item analysis shows that (i) the percentage scores at Cr level are much higher than those at R level, (ii) the percentage scores at Ca level are much higher than those at A level, (iii) the percentage scores at R level are much
higher than those at A level for both Oriya & English medium schools. (6) While comparing the data between Oriya and English medium schools, no significant difference was found at any level. However, the mean values are slightly higher for English medium than those of Oriya medium. This reveals that the children of English medium schools have developed some what better experiences of concrete objects in their day-to-day life than their counterparts in Oriya medium schools. (7) The following learning problems were identified related to arithmetic difficulties: i. Memory problems, ii. Reading problems, iii. Language problems, iv. Inability to group sets v. Ordinality problems vi. Symbol Association problem vii. Lack of the concept of place values, viii. Inability to subtract, ix. Lack of Mastery of computational skills, etc. (8) Significant reduction in errors reveals that concrete materials are effective means to develop mathematical concepts and skills.

MONDAL ATUL KRISHNA. (1999) Studied the teaching and learning of mathematics in schools in town and village areas in a comparative study through ADTM.

**Problem:** It attempts to study teaching learning of mathematics in schools in town and village areas.

**Objective:** To compare the students of village areas with the students of town areas in terms of their achievement on ADTM.

**Methodology:** The results of ADTM (Achievement cum Diagnostic Test in Mathematics) from the year 1991 to 1998 of students who appeared from 34 centres of 4 subdivisions of Midnapur District, were treated as the data. Centres situated at Midnapur, Kharagpur, Jhargram municipalities were termed as village centers. The results for classes IV to IX were taken for consideration. The collected data were treated with percentage analysis.

**Major Findings:** (1) The percentage of certificate holders for each class from the year 1993-1998 was nearly stable both for town and village area;
whereas the variation for 1991 and 1992 was remarkable. (2) The number of participants was increasing from year to year which may mean that the test was gradually becoming popular among the students. (3) Students from the schools in town areas did far better than those in village areas.

WAITS, ROBERTS DALE (2000) made a study on the effects of everyday mathematics on student achievement of third-fourth and fifth-grade students in a large north Texas urban school district.

**Problem:** Data were examined from a student records in a large North Texas urban school district who were taught with two different mathematics curricula to determine whether or not they had different effects on student achievement. One of the mathematics curricula, everyday Mathematics, was developed upon national mathematic standards, written by the National council of Teachers of Mathematics. The other mathematics curriculum was district – approved, using a textbook from a large publisher, with a more traditional approach.

**Objective:** To study the effect of every day mathematics on student achievement of third-fourth and fifth-grade students in a large north Texas urban school district.

**Methodology:** The students selected for the experimental group came from six schools that had implemented the every day Mathematics curriculum for the 1998-99 school year. An experimental group was formed from these students. Twelve schools with similar socio economic ratios, ethnic make up and 1998 lower test of Basic Skills mathematic score profiles were selected. A control group was formed this population of students that was similar to the experimental group with the exception of having been taught using a district-approved mathematics curriculum.

These two groups were very similar in socio-economic, ethnic, gender and grade level make up. Most importantly, the experimental group and control
group were almost identical (there was no statistically significant difference) in their 1998 I owe a Test of Basic skills mathematics scores, a gauge used to demonstrate that prior mathematics ability was equal going into the 1998-99 school year.

Findings: 1. In the statistical analysis almost all comparisons showed that the experimental group taught with the everyday Mathematics curriculum had higher scores on the 1999 Texas Assessment of Academic Skills mathematics test. 2. When compared to the children with similar mathematics ability at the beginning of the 1998-99 school year the students in this study who were taught using Everyday Mathematics showed greater achievement gains in classes that used the district approved curriculum.


Objectives: (i) To find out the level of achievement of the pupils in mathematics, in the addition unit (ii) To teach the addition unit in mathematics to the pupils through addition games (iii) To find out the level of achievement of the pupils in mathematics, in the addition unit, after teaching through addition games. (iv) To compare the pre-test and post-test levels of achievement of the pupils in mathematics.

Findings: (1). The addition games helped the pupils to learn mathematics better. The academic achievement of the pupils has improved better than at the initial level. Learning through addition games is a better and easier way of learning mathematics. (2) By learning mathematics through addition games, improvement in the academic achievement and in the understanding of mathematics of the pupils can be effected. (3) There is no gender difference; both boys and girls have benefited equally by learning mathematics through addition games.
SHARMA M.C. (2001) did research on self-learning cards for developing concepts among Primary School children.

Objective: The study aims to observe the actual use of self-learning cards prepared on the basis of Bruner’s Concept Attainment Model for developing concepts among primary school children.

Methodology: The sample consisted of 160 students selected from Classes I to IV (40 students from each class). In each class, two groups consisting of 20 students each were formed. One group was taught concepts through normal teaching and the other group was taught with the help of self-learning cards. A structured interview was employed to know the attitude and interest of children towards learning through self-learning cards. ‘t’ test was used to analyse data.

Findings: (1) It was found that teaching with the help of self-learning cards was quite effective for developing concepts among primary school children. (2) It was also inferred through structured interview with children that learning through self-learning cards was quite interesting, thought provoking and enjoyable.

SHAND, KATHRYU BROWN (2002) conducted a study on thinking to learn and the potential of exploratory conversations in learning mathematics.

Objective: To explore the use of talk as a vehicle for mathematical learning.

Research questions. 1. What is the role of exploratory conversations in helping children make sense of mathematics? 2. What are the students’ perception of talk as a vehicle for mathematical learning? 3. What is the teachers role in creating a classroom where the language of mathematics is used?
Methodology: A naturalistic method of research guided the data collection, data analysis and the interpretation in the natural context of the classroom. During this investigation, I orchestrated worthwhile mathematical experiences that engaged students intellect, called for problem solving and mathematical reasoning, and promoted communication about mathematics. I audio taped, videotaped, transcribed and analyzed the students conversations as they engaged in exploratory mathematical conversations. Methods based on sound research, such as constructivist, approach to the teaching and learning of mathematics the use of children’s literature, and the power of talk in helping children make sense of mathematics were incorporated throughout the study.

Findings: The goals of the second grade mathematics curriculum were enhanced and enriched in this particular classroom through the “talk” experiences provided.

2.6 SYNTHESIS OF STUDIES ON LEARNING MATHEMATICS


2.7.STUDIES ON DIAGNOSTIC TESTS, ACHIEVEMENT TESTS AND REMEDIAL TEACHING

DAS, K.C and BARUA, A.P., (1968) conducted a study on the effect of remedial teaching in arithmetic among grade IV pupils.

Objective: To determine the effect of remedial teaching in arithmetic in grade IV.

Methodology: For the purpose of diagnosis of individual differences, the first seven series of tests from F.J.Schonells' diagnostic arithmetic Tests were used. There were altogether 604 sums. Pre-test, post-test experimental – control group design was followed. In each group there were 30 graded IV pupils. The experimental group was given remedial teaching and the control group was
taught as usual by the class teacher, Student t-test was used to compare test-wise and total average achievement of both the groups.

**Major Findings:** The remedial teaching has definitely improved significantly the achievements in arithmetic. The major educational implication of the study is that remedial teaching even for a small period compared to the total duration of the working days in the year can effect significant improvement in achievement in arithmetic.

SINHA (1977) constituted a diagnostic test of arithmetic vocabulary for grade VI, VII & VIII.

**Objectives:** To construct a diagnostic test of Arithmetic Vocabulary for grades VI, VII, and VIII. The sample was drawn from six schools in Calcutta.

**Findings:** (1) Analysis of backwardness levels revealed how some of the concepts got less importance in the curriculum of the class. (2) Power of grasping the concepts and understanding the meaning of arithmetic terms was found to grow with maturation.

RASTOGI, S. (1983) conducted a study on Diagnosis of weaknesses in Arithmetic as Related to the Basic Arithmetic Skills and Their Remedial Measures.

**Objectives:** (i) to establish a relationship between a achievement in Mathematics and command over basic arithmetic skills (ii) to establish a relationship between command over basic arithmetic skills and attitude towards Mathematics. (iii) to establish a relationship between achievement in Mathematics and attitude towards mathematics (iv) to establish a relationship between general intelligence and the three attributes, viz, command over basics arithmetic skills, achievement in Mathematics, and attitude towards Mathematics (v) to develop a diagnostic test to determine specific weaknesses of students backward in basic arithmetic skills (vi) to develop a suitable programme for
remedial work in basic arithmetic skills, and (vii) to investigate other causes of backwardness in Mathematics and their treatment.

**Methodology:** The design of the study was essentially experimental in nature. A test of basic skills in arithmetic and an attitude scale to measure attitude towards Mathematics were constructed and standardized. A diagnostic test of basic arithmetic skill was also constructed. Apart from these tools, Raven’s standard Progressive Matrices a Mathematics Achievement survey test made by NCERT and a course of self-help in basics arithmetic skills which was a programme of remedial work developed to use as a treatment for the study were used. The final sample included 406 class VII student (230 boys and 176 girls) of nine different schools and from each district of Arunachal Pradesh. In order to study sex differences and the effect of treatment on the two sexes approximately equal number of boys and girls were included the sample for the study.

**Major findings:** (1) Out of the important causes of backwardness in Mathematics was the poor command over basic arithmetic skills. (2) Attitudes were closely linked with achievement. (3) When command over basic arithmetic skills improved, attitude towards Mathematics became more favourable and achievement in Mathematics increased. (4) Basic arithmetic skills could very quickly and conveniently be mastered through the course of self-help in basic arithmetic skills as developed during the study. (5) There were no significant sex differences in either attitude towards Mathematics or achievement in Mathematics. (6) The course of self-help in basic arithmetic skills was equally effective with either sex.

The study provided a method and a few tools for combating stagnation wastage and weakness in the subject. The method and tools were economical, convenient, time-saving, and did not require additional man power or excessive demand on teachers busy time schedule.
DUTTA, A. (1986) conducted a study on the diagnosis and prevention of learning disabilities in the reasoning power of the studies in the geometry.

**Objectives:** (i) to diagnose the major patterns of disabilities in a specific area of Geometry with the help of tools specially developed on the purpose and (ii) to try out experimentally teaching methods which would prevent development of learning disabilities in the area under study. Three hypotheses were examined.

**Methodology:** The study had two dimensions. The first was diagnosis of patterns of disabilities of students in the concepts of congruency of triangles in geometry. The second part consists of preventive measures adopted by the experimenter to check the development of learning disabilities in this area with the help of audio-visual methods and techniques. A diagnostic test in “Congruency of triangles” was constructed to identify pattern of disabilities, and was administered on 286, slow learners in geometry. Structured individual interviews were conducted with 20 percent students selected randomly from the original sample. In the second phase the experiment was conducted in four secondary schools with controlled and experimental groups. The initial measures by the verbal creativity test and criterion measures by the diagnostic test in geometry were subjected to an analyses of co-variance.

**Findings:** 1) Thirty three major patterns of disabilities were identified. 2) The experimental groups taught by audio-visual materials and techniques achieved significantly more than the controlled groups taught by conventional methods.

RAMAN, J. (1989) identified the errors committed by students in calculus in his study titled “Impact of remedial teaching programmes for the common errors committed by students of Standard XI in calculus.”
Problem: An attempt is made to identify the impact of remedial teaching programmes on the common errors, committed by students of Standard Xi in calculus.

Objectives: (i) To identify the errors committed by the students under four categories, entry behaviour, perceptual, conceptual and computational, in the different divisions of calculus at Standard XI level, (ii) to identify the percentage of error under each category of errors, (iii) to design some suitable remedial teaching programmes for the students of Standard XI to minimize these errors in calculus, (iv) to implement the remedial teaching programmes for the students of Standard XI in order to minimize these errors in learning calculus, and (v) to find out the impact of the remedial teaching programmes implemented for the students of Standard XI in minimizing these errors in learning calculus.

Methodology: The sample comprised students of standard XI, vocational group as the experimental group, and the computer science group students as the control group. The tools used in the study two entry-behaviour test, one in trigonometry and the other in analytical geometry, and a diagnostic test. Statistical techniques used to analyse the data included mean, SD and ‘t’ test.

Major Findings: (1) Students committed more conceptual errors, followed by computational errors, entry behaviour errors and perceptual errors, (2) The control group students’ achievement in the post-test did not differ significantly with the pre-test. (3) The experimental-group students’ achievement in the post-test was significant, and they were able to score more marks in the post-test. (4) Students of both the control group and the experimental group did not differ significantly in the pre-test scores. (5) Students of both the experimental group and the control group differed significantly in the scores in the post-test. (6) The experimental group students differed significantly among themselves with respect to their mean errors in all the eight concepts in the pre-test. (7) The experimental-group students did not differ among themselves significantly with
respect to mean errors in all the eight concepts in the post-test after the remedial teaching.

CHEL, MADAN MOHAN. (1990) conducted a study on the diagnosis and remediation of underachievement in compulsory mathematics of madhyamik examination in West Bengal.

Problem: The study attempts to diagnose and suggest remediation of underachievement in the compulsory mathematics of the madhyamik examination in West Bengal.

Objectives: (i) To identify the different kinds of difficulties related to underachievement in the compulsory mathematics of the madhyamik examination in West Bengal. (ii) to seek out the types of errors which are identified from the performances of the students in their answer scripts, (iii) to find out the factors, according to the opinion of students, teachers and guardians, that are responsible for underachievement in mathematics at the secondary level, (iv) to know the extent to which the procedure of evaluation is responsible for the underachievement, (v) to know the reinforcers and noises in communicating mathematical principles to learning, (vi) to find out the remediation programme that should be suggested for students, teachers and others for obtaining better achievement in mathematics at the secondary level, and (vii) to find out what should be the role of the authority or the management in implementing the remedial programme.

Methodology: The sample comprised urban, semi-urban and rural students of classes VI to X of West Bengal. The case study method was used in collecting the data. The statistics used to treat the collected data were mean and rank differences correlation.

Major Findings: (1) The main difficulties faced by students included, concept gaps, confusion in understanding mathematical language, stereotype way
of presenting contents and lack of openness in teaching. (2) The major mistakes found in the performances of students and teacher trainees in the areas include mathematisation of verbal problems, interpretations of mathematical results and learning new topics in mathematics. (3) Underachievement was caused due to lack of understanding of the mathematical concepts of the earlier stage, and the abstract nature of mathematics. (4) Errors were caused due to versatility and variability of contents, lack of time, etc. (5) Noises in the channel of message were fear, anxiety, psychological imbalance, the faculty’s arrangement of contents. (6) Reinforces in the channel of learning were readiness, interest, active involvement, use of effective materials of instruction and learning efficiency.


**Problem:** This study attempts to find out the errors committed by students of Standard IX in solving problems in geometry, and tries out the remedial packages.

**Objectives:** (i) To identify and categorise the errors committed by the students of Standard IX in solving problems in geometry (ii) to design some suitable remedial teaching programmes for the students of Standard IX in solving problems in geometry, and (iii) to implement the remedial teaching programmes with the students of Standard IX in order to minimize these errors in solving problems in geometry.

**Methodology:** The case study method was used by the investigator to observe the causes of committing errors by students of Standard IX in solving geometry problems. To collect data a questionnaire developed by the investigator was sent to 20 expert geometry teachers of Standard IX. Percentages were computed for comparison and interpretation of errors. The collected data were treated with mean, standard deviation and ‘t’ test.
Major Findings: (1) It was found that the student's mean achievement scores were increased and the errors were considerable reduced in the post-test. (2) The level of performance of the students in the post-test was found to be high after the implementation of the remedial programme.

GOEL, MANISHA (1996) did research on arithmetic difficulties among primary grade children.

Objectives: (1) To study whether there is any significant difference in the number of errors made by children at each grade level; (ii) to find out the areas of difficulty faced by children at each grade level; and (iii) to study the differences in the nature of errors made by high and low achievers.

Method: A stratified random sample of 90 children, 18 from each grade, was randomly selected from classes I to V belonging to the school of Banasthali Vidyapith University, Rajasthan – equal number of boys and girls at high, average and low proficiency level in arithmetic, as indicated by their arithmetic teachers’ ratings. Self-made achievement test was used for data collection. The collected data were treated with percentage ration of errors, mean, S.D. ‘t’ test, and ANOVA.

Findings: (1) The total number of errors made by children in different grades varied significantly. (2) Areas of difficulty in arithmetic were different for each grade as the complexity increases grade-wise. (3) Difficulties were mainly due to incorrect conceptualizations, inability to master basic facts and the use of incorrect operation while solving the problem. (4) Nature of errors made by high and low achievers was found to be different. Number problems, errors of basic fact, algorithm and incorrect operation were most common in low achievers, High achievers made comparatively less errors than low achievers.

BANERJEE, SURENDRANATH. (1997) conducted a study on the mathematics competencies of the pupils of the primary school leaving class.
Problem: The study aims to examine the mathematical competencies of the pupils of the primary school leaving class.

Objectives: To present a data based picture of the learning gains in mathematics in terms of competencies of the primary school leaving pupils of a district of West Bengal by a scientific monitoring procedure.

Methodology: A sample of class IV Bengali pupils was selected randomly from 57 Bengali medium primary schools of four different strata, viz, Government, Municipal Urban and Rural in the Hoogly District. The data were collected using achievement test of mathematics. The collected data were treated with mean, SD and correlation.

Major Findings: The pupils attained expected standard of competency in the use of numbers, computational ability and concrete problem solving of mathematics, while they did not acquire competency up to deserving standard in calculative manipulation of sums and geometric ideas.


Problem: The present study attempted to explore the errors made by primary students on each concept of mathematics in Minimum Levels of Learning (MLL) curriculum.

Objective: To analyse the errors made by primary students on mathematical concepts in MLL curriculum.

Methodology: The sample comprised 326 students of Grade IV in Maharashtra. Data were collected using Mathematics Achievement Test (MAT) based on MLL nature and possible origin of errors were identified based on the observations of procedures that the students adopted to solve the problem and through informal discussions with students.
Major Findings: (1) Major aspects of the response error were rooted in an alternative understandable pattern of rules. (2) Errors were the result of incorrect induction from examples. (3) Most of the errors were produced by a process of dualism i.e. a different rule when zero involves as seen earlier in case of place value, subtraction and multiplication. (4) Errors triggered due to inadequacy of language used in the definitions, rules or procedure names.


Problem: This study attempts to analyze errors in mathematics at senior secondary level.

Objective: To enlist various types of errors committed by students at the board examination.

Methodology: A sample of 500 mathematics answer books, 250 in each paper was randomly selected out of the Board of Secondary Examination, Rajasthan 1994. The descriptive part of the question papers of Senior Secondary Examination 1994 was thoroughly analyzed on 15 different types of errors. Frequencies of different types of errors pertaining to each question for all the five categories were tabulated and percentage has been calculated out of the number of students who actually attempted that particular question.

Major findings: (1) Computational errors, using lower level concepts, and lack of systematic mark were identified as the major errors committed. (2) The areas in which errors were committed were set theory, trigonometry, complex numbers, coordinate geometry, vectors, probability, matrices, curve training, differentiability, differentiation of a given function, application of differential coefficient, limit of a function indefinite in definite ingratiation, and application of integration.
SMITH, JAMES EDWARD (1999) conducted a study in two ways of instructional approach utilizing in seventh grade mathematics.

The purpose of this study was to explore whether or not there was a difference in mathematics achievement of seventh grade students when a developmental instructional approach was used, compared to a practice approach. The sample for this study consisted of 58 seventh grade students. Two treatment groups were established. An experimental group was taught using a developmental approach, while a control group was taught using a practice approach. The Stanford Achievement Test, Eighth Edition was used as a pre- and post-test to measure differences between the two teaching methods, demographic data were also obtained. The data were analyzed using SPSS for windows, ANOVA and ANCOVA procedures were used to test hypotheses.

Findings: (1) No significant difference in the ability to apply mathematical concepts to problem-solving situations was found between the two treatment groups (2) A significant difference in computational skills was found between the two groups of students. (3) No significant difference in skills to interpret graphs and charts and apply principles of geometry, measurement and probability was found between the two groups of students. (4) No significant difference in achievement, as measured by class average was found between the two treatment groups.

CHAKRABARTI, BOOPAL PRASAD (1999) studied the impact of the ‘Achievement-cum-Diagnostic test’ in the performances of the students in mathematics.

Problem: It attempts to study the impact of the ‘achievement-cum-diagnostic test in the performances of the students in mathematics.

Objectives: (i) To examine whether the ADTM helps in improving the performances of the students in mathematics, (ii) To ascertain how comprehension of mathematical ideas are related to over-all achievements in
mathematics, and (iii) To compare the performances of the students of rural and urban areas in the ‘ADTM’ of different classes.

**Methodology:** The marks obtained by the students of different classes (class V to class IX) in their '98 Annual Examination have been taken for both the urban and rural schools who have appeared in the ADTM. The marks have also been taken for both types of schools who have not appeared in the ADTM. The mean scores of the marks obtained was calculated and then the percentage was found out.

**Major Findings:** (1) The performance of the students who have appeared in ADTM was much better in case of the urban and rural students in their SAT (School Achievement Test) in comparison to the performance of the students who have not appeared in the ADTM irrespective of the rural and urban background. (2) Out of the appeared candidates in ADTM the performance of the rural students in their ‘SAT’ was lagging far behind from that of their urban counterparts. (3) The performance of the rural students in ‘SAT’ who have appeared in the ADTM of CPSM. (4) The performance of the urban students was much better than the rural students in the ‘CIT’. This was true for all the classes from class V to class IX. However, the performance of both the urban and rural students belonging to both the rural and urban schools was better in ADTM than in ‘CIT’, but from class IX the performances of the students improved in the ‘CIT’ and finally the growth-curve of the student’s performance in the ‘CIT’ overcame the growth-curve of the student’s performance in the rest of the items of ADTM of CPSM.

CHAKRABARTI, BHUPAL PRASAD. (2000) made a study of performances of students in mathematics through the use of ‘comprehension type test” (CTT)

**Objectives:** (i) To examine the impact of Comprehension Type Test (CTT) in gradual improvement of mathematical performances of the students in different classes; and (ii) to examine whether the ‘CTT’ helps the students (400
rural and 400 urban) from classes IV and V was selected for the study. Comprehension Test of Achievement–cum-Diagnostic Test in Mathematics (ADTM) (IV-V, 1999) was used for the collection of data. The collected data was analyzed using percentage.

Findings: (1) It was found that the comprehension ability increases with the age. (2) The students of both the genders and grades scored high in traditional test as compared to CTT, because of their acquaintance with the nature of traditional test. (3) It was revealed that the frequent use of CTT in Mathematics could foster the ability of comprehension in mathematics.


Objectives: (i) To select items form the Arithmetic Diagnostic Test for Primary School Children which measures fundamental operations and problem-solving in Addition, Subtraction, Multiplication and Division. (ii) to find out the percentage of children of Grade V from disadvantaged groups who have difficulty in different skills of the above operations; (iii) to identify the common errors committed by the children while doing the sums; and (iv) to compare the groups formed on the basis of district, school, section and gender in terms of the percentage of children exhibiting specific difficulties.

Method: The sample consisted of 138 students from four government schools. Arithmetic diagnostic test for primary school children by Ramaa (1994) was used for the data collection. The collected data was analyzed using the percentage.

Findings: (1) It was found that there was no significant difference with regard to the percentage of children belonging to the following categories – masters, partial achievers, and non-masters. (2) Similar observations were also found regarding different schools, sections and boys and girls in each district. (3)
It was also found that the socio-cultural differences of the districts and the variations in the school related variables as well as gender influence mathematics learning. (4) In almost all the criterion measures, considerable percentage of children experienced difficulties. (5) It was found that the number of partial achievers and non-masters were more in almost all the criterion measures and in some cases majority was non-masters. (6) It was also found that the subjects were average in reading and writing, as far as the teachers' opinion was concerned and they had severe difficulty in Mathematics.

CHAKRABORTI, BHUPAL PRASAD (2002) conducted experiments in using comprehension type tests with multiple choice type items in primary mathematics.

**Objective:** The study aims to find out the efficacy of the 'Comprehension Type Test' (CTI) through multiple-choice type items in different class room situations.

**Method:** The sample consisted of 339 students from two schools of equal standard (standards were measured according to the performance of the students in their school achievement tests), one school from the urban area and the other from semi-urban area. From each school two classes namely class IV (with 75 students from urban and 90 students from semi-urban areas) and Class V (with 85 students from urban and 90 students from semi-urban areas) have been considered. Two kinds of Comprehension Type Test (CTI) (multiple type and non-multiple type) involving two passages (each carrying 10 questions) were administered for experiment. In both the classes (IV and V) of the schools in Urban and semi-urban areas. Percentages were used for the analysis of the data.

**Findings:** (1) The urban and semi-urban students performed better when they were provided with multiple choice items. (2) The urban students performed better (both in multiple-choice and non-multiple-choice items) than semi urban students for both the classes.
2.8 SYNTHESIS OF STUDIES ON DIAGNOSTIC TESTS, ACHIEVEMENT TESTS AND REMEDIAL TEACHING

An analysis of the achievement and competency levels through diagnostic tests, achievement tests and the remedial teaching suggested by various researchers may be summarized as follows: Das, K.C. and Barua, A.P. (1968) conducted a study to determine the effect of remedial teaching in arithmetic among grade IV pupils. Sinha (1977) constituted a diagnostic test of arithmetic vocabulary for grade VI, VII & VIII. An analysis of the backward levels revealed that some of the concepts got less importance in the curriculum and the power of grasping the concepts and understanding the meaning of arithmetic terms was found to grow with maturation. The study conducted by Rastogi S. (1983) made a diagnosis of weakness in Arithmetic and establishes a relationship between achievement in Mathematics and command over basic arithmetic skills and attitude towards mathematics. The study conducted by Dutta A. (1986) diagnosed the major patterns of learning disabilities in reasoning power in a specific area in Geometry and tries to find out the methods of prevention of learning disabilities in the area. Raman, J. (1989) identified the errors committed by students in calculus under four categories and found that most of the errors were conceptual errors followed by computational errors, entry behaviour errors and perceptual errors and has developed a remedial package which reduces all types of errors significantly. Gurusamy, S. (1990) attempted to find out the errors committed by students of Standard IX in solving problems in geometry and tries out the remedial packages. Goel, Manisha (1996) explored the areas of arithmetic difficulties faced by primary grade children and studies the differences in the nature of errors made by high and low achievers. Banerjee, Surendranath, (1997) presented a data based picture of the learning gains in mathematics in terms of mathematical competencies of the pupils of the primary school leaving class. The study by Pal G.C., Pradhan H.C. and Chitra Natarajan (1997) attempted to explore the errors made by primary students on each concept of mathematics in Minimum Levels of Learning (MLL) curriculum using
Mathematics Achievement Test (MAT) based on MLL nature by identifying the possible origin of errors. The study by Khichi K.S., (1998) attempted to analyse errors in Mathematics at senior secondary level and enlists the various types of errors committed by students at the board examination. Chakrabarti, Bhupal Prasad, (1999) studied the impact of the Achievement-cum-diagnostic testing the performances of the students in mathematics. Smith, James Edward (1999) conducted a study in two ways of instructional approaches, a developmental instruction approach compared to a practice approach to measure the differences between the two teaching methods. The study conducted by Chakrabarti, Bhupal Prasad, (2000) examined the impact of Comprehension Type Test (CTT) in gradual improvement of mathematical performances of students indifferent classes. Ramaa, S. and Gowramma, I.P. (2001) analyses the difficulties in Arithmetic problem-solving among disadvantaged children studying in grade V. Chakraborti, Bhupal Prasad (2002) experimented on the use of ‘Comprehension type tests’ (CTI) with multiple choice type items in primary mathematics.

2.9. STUDIES ON ATTITUDE TOWARDS LEARNING OF MATHEMATICS


Problem: This study tries to explore the relationship of mathematics learning with different temperamental variables. It attempts to justify the identification of a certain closely knit group of personality variables (ten only) which may be related with mathematics in the cognitive domain.

Objectives: (i) To study the relationship of mathematics learning and temperamental traits, (ii) to study the influence of sex differences and socio-economic status on the variables, temperamental traits, mathematics learning, and the cognitive variables considered conducive to mathematical learning, and
(iii) to study the temperamental factor structure of high, average and low achievers as well as of over, normal and underachievers in mathematics.

Methodology: The sample of the study comprised 1,008 subjects selected by the stratified random sampling procedure. 491 boys and 517 girls studying in Standard IX were selected from 22 English medium schools selected randomly from the secondary schools in Nagpur. Using the regression technique, the sample was classified into high achievers, average achievers and low achievers as also over-normal and underachievers. The tools used to collect data included the Thorndike Dimensions of Temperament Inventory, the SRA Tests of Educational Ability, an Achievement Test in Mathematics, and a Socio-economic Status Scale. Inter-correlations, mean, standard deviation, critical ratio, correlation and factor analysis were used to treat the collected data.

Major Findings: (1) A low but positive and highly significant correlation was found between mathematics learning and responsible and ascendant temperaments. (2) A low but negative and highly significant correlation was found between mathematics learning and temperamental dimensions, viz. sociable, accepting and impulsive, which means the negative ends of these traits. (3) IQ and reasoning were found significantly related to the dimensions ascendant, responsible, critical and plentiful, and language ability, to the dimensions: responsible, critical, solitary, tender-minded and lethargic. (4) Girls were found more gloomy, more tender-minded and more irritable than boys who were found more active than girls. (5) As far as cognitive abilities, basal to mathematics learning are concerned, boys were found superior to girls on quantitative and total educational ability and mathematics learning. (6) The temperamental profiles of high, average and low achievers were found to differ considerably from one another. (7) The high achievers were found to be more critical, more responsible, more solitary and more ascendant than the average achievers, who were tender-minded. (8) Middle-class students were found more active than the students from upper strata. (9) The three groups, i.e. the
high average and low socio-economic status groups were found to be in the
descending order on all the cognitive abilities considered as basal to mathematics
learning.

HARIHARAN, D. (1992). Studied the attitudes of high School students towards
homework and their achievement in mathematics.

Problem: The study attempts to find out the attitudes high school
students towards homework and their achievement in mathematics.

Objectives: (i) To measure the attitudes of high school students towards
homework in mathematics, (ii) to measure their academic achievement in
mathematics, and (iii) to find out the relationship between the attitudes of high
school students towards homework and their achievement in mathematics.

Methodology: The sample of the study comprised 250 students of class IX
selected from the various high schools of Madurai City. A Homework Attitude
Scale (HAS) was constructed and used for measuring the attitude of the sample.
An achievement test was also constructed to measure the academic achievement
of the high school students in mathematics. The mean, SD, t-test and Pearson’s
product moment correlation were used for statistical analysis.

Major Findings: (1) Girls were higher than boys in their attitude towards
homework. (2) Urban students were higher than rural students in their attitude
towards homework. (3) Private school students were higher than the
government school students in their attitude towards homework. (4) The
attitudes of high school students towards homework were related to their
achievement level in mathematics.

ROSALI .A, (1992) studied the relationship between attitude of students towards
mathematics and achievement.

Problem: The study attempts to find out whether high school students
have a favourable attitude towards learning mathematics, and whether the
favourable and unfavourable attitudes of the students affect their achievement in mathematics.

Objectives: (i) To construct an attitude scale to measure the attitude of high schools students to measure the attitude of high schools students towards learning of mathematics, (ii) to construct an achievement test in mathematics, and (iii) to find out the relationship between attitude and achievement in mathematics.

Methodology: The sample consisted of 200 students of class X in eight high schools in Dindigul Town. A Mathematics attitude Scale (MAS) and an Achievement Test in Mathematics were constructed and used in the study. The statistical techniques used were the mea, SD, chi-square, Pearson’s product-moment correlation and t-test.

Major Findings: (1) The attitude of high school students towards learning mathematics and their achievement in mathematics were related. (2) Urban girls had a more positive attitude towards mathematics than rural girls. (3) Similarly, urban boys had a more positive attitude towards mathematics than rural boys. (4) Girls were higher than boys in their achievement in mathematics. (5) Urban girls were higher than rural girls in their achievement in mathematics.


Problem: It attempts to study students’ perceptions of mathematics and its teaching at school level.

Objectives: (i) To find out whether students know about the nature and values of mathematics, (ii) To find out whether students have confidence in learning mathematics, (iii) To find out gender difference in students’ perception of mathematics, (iv) To find out the relationship between perception and achievement in mathematics, (v) To find out the opportunities available to
students regarding expression of their views, (vi) To find out the students’ interest to do well in mathematics examination (vii) To find out whether students were aware of their parental aspirations regarding mathematics, and (viii) To find out perception of students regarding school facilities.

Methodology: The sample comprised 163 students studying in class IX chosen from schools from Andhra Pradesh, two schools each from Kerala and Karnataka. Data were collected using an opinionnaire. Perception index number was obtained to analyze the data.

Major findings: (1) Students had positive perception regarding all the aspects except in case of school facilities. (2) Most of the students had confidence in learning mathematics (3) Boys had slightly better positive perception of mathematics in comparison to girls. This was not true in case of Kerala girls. There was a positive correlation between perception and achievement in mathematics. (5) Majority of the students felt that they were never asked to express their views or to give their comments or opinions in schools. (6) Students were knowledgeable about the nature and value of mathematics. (7) Every student was interested to do well in mathematics examinations. (8) Students were aware of their parental aspirations regarding (9) Students were happy with the existing mathematics curriculum (10) Majority of the students were not happy with existing facilities for teaching mathematics.

KUMAR, LALIT (1996) conducted a study on the attitude of primary school teachers towards mathematics.

Objective: The study compares the attitudes of teachers towards mathematics across gender and also across teachers working in Government and Private schools.

Method: Using stratified random sampling 200 primary school teachers from 30 schools of Bharatpur District, were taken. Likert type attitude towards
Mathematics Inventory, developed by Lalit Kumar, was used for data collection. The collected data were analyzed using percentage, Mean, S.D., t-test.

Findings: (1) less than one-fifth of the primary school teachers possesses high favourable attitude towards mathematics. Nearly half the teachers have low scores on the attitude measure. (2) Among the small proportion of teachers having high favourable attitude, male teachers and teachers working in private schools outnumber their counterparts.

PRISELAC, JODI ZICCARDI (1999) did research on the role that, the teachers’ beliefs about Mathematics, plays in bringing about a change in the elementary mathematics class-room:

Problem: In recent years mathematics educators have stressed the important of students developing deep and interconnected understandings of mathematical concepts and principles and not just ability to memorize formulas and apply procedures. These educators found that mathematics is best learned in environments where students are encouraged to discover and create knowledge of mathematics through inquiry and problem solving. Despite countless efforts aimed at encouraging teachers to embrace this view of teaching mathematics, studies have shown that most teachers have not fully implemented these ideas. Most professional development programs neglect to take into account the beliefs that teachers hold about the nature of mathematics and have therefore had little impact on changing teaching.

Objective: (i) To provide an understanding of the relationship between teachers’ beliefs about mathematics (ii) To show how Mathematics is taught (iii) To show the ways in which that relationship interacts with professional development to bring about change in teaching practices.

Methodology: As part of this study fifteen teachers from a public elementary school in Los Angeles participated in a professional development
program designed to allow the teachers to reflect on their beliefs and practice and to consider new ways of teaching mathematics. Teachers met to analyze student work, do mathematics problem solving, and explore alternative strategies for teaching. Data was gathered from written reflections of the teachers and taped conversations during work group discussions. Teachers’ beliefs of mathematics were identified and connected to their instructional practice. Over half the teachers showed evidence of changing their practice as a result of participating in the program.

**Findings:** 1. This study offer strong support for the utility of designing professional development models that begin with understanding teachers beliefs about mathematics. Analyzing student work and doing mathematics provide a structure within which teachers can reflect on their beliefs and practice. 2. Exploring alternative strategies gives teachers the tools to change and improve the quality of mathematics instruction in their classrooms.


**Objectives:** (i) To study the effect of instructional and learning style congruence on mathematics achievement attitudes (ii) To study the behaviour of understanding chronically misbehaving upper-elementary students.

**Methodology:** The investigator identified fourth–fifth and sixth-grade chronically misbehaving under achieving students in a suburban elementary school. This research utilized the Dunn and Dunn Learning Style Model to measure classroom behaviours, attitudes towards learning, and mathematics-achievement test scores. Brain-processing styles were analyzed and related to brain-behaviour model. A repeated-measures design was implemented to investigate congruent and incongruent – learning climates. The Dunn and Dunn Learning Style Inventory was administered and the resulting profiles were explained in detail to teachers, students and parents.
The Conners Teacher Rating Scale Revised (CTRS-R) was used to measure behaviours. A series of Pearson – product – moment correlations were performed correlating the base-line CTRS - R scores with the difference in the behavioural ratings collected after each session. These results indicated that most poorly behaved subjects evidenced more misconduct while being instructed with traditional methodology than while being instructed with strategies that were responsive to their learning – style preferences.

Achievement was measured by using the district – approved pre tests and post tests administered immediately preceding and following each session. An ANOVA, which tested within subject contrasts was performed. This test was not significant at the p< .05 level. However, post tests were re – administered four months later to fourth and fifth grade subjects to evaluate long – term retention. t-tests for paired samples indicated that subjects taught with instructional strategies that were congruent with their learning style strengths retained statistically (p< .001) more information than those subjects who were instructed with traditional strategies.

Findings: The attitudes subjects exhibited toward learning in the two instructional settings were measured on the sematic Differential Scale (Pizzo – 1981) A single sample t- test was performed and those results also were statistically significant at the p<.001 level. Means ranged from 3.93 to 4.54 with the null value set at 3. Attitudes of the subjects were overwhelmingly positive toward the learning – style responsive strategies.

FRAKS, RHOONDA DAWN (2002) studied the effects of traditional versus learning- styles instructional methods on seventh-grade students achievement, attitudes, empathy and transfer of skills through a study of the Holocaust.

Objectives: i).To examine the relationships among seventh-grade students achievement scores, ii) To study the attitudes toward instructional approaches, empathy scales, and transfer of skills between traditional versus multi sensory instruction.
Methodology: The dependent variables for this investigation were gain scores on achievement and empathy post tests, scores on an attitudinal survey, and weighted average scores obtained from transfer tasks. The independent variable was the instructional methodology employed.

The sample consisted of 105 heterogeneously grouped, seventh-grade students. The Learning Style Inventory (LSI) (Dunn, Dunn, & Price 2000) was administered to determine learning–style preferences. The control Group was taught lessons about the Holocaust using a traditional teaching method and the Experimental group was taught the same content using multi sensory instructional resources. The Semantic Differential Scale (SDS) (Pizzo, 1981) was administered to reveal attitudinal differences. The Balanced Emotional Empathy Scale (BEES) (Mehrabian 2000) was administered to reveal empathetic differences. Finally, form A of the Moral Judgment Interview (Koulbery 1987) was administered to determine transfer of skills.

The traditional approach included reading from a text book, graphic organizers and responding to questions in small groups and independently: The multi sensory approach included fire instructional stations established in different sections of the class room to permit students to learn by reading text; manipulating Flip Chutes; assembling task Cards; using Pick – A – Holes using Electroboards reading a programmed Learning Sequence; using a Contract Activity Package; and engaging in a kinesthetic Floor Game activity. Audiotapes and scripts were provided at each station and students circulated among the stations in groups of four to six.

Findings: 1. The data subjected to statistical analyses supported the implementation of a multi sensory rather than a traditional approach for teaching lessons of the Holocaust. t-tests revealed a positive and statistically significant impact on achievement scores (p>.001) 2. Significance was revealed on students gain scores on the empathy scale when taught through a multi sensory approach (P<.001) 3. More positive attitudes were revealed when students were
instructed with a multi sensory approach (p< .001) Moderate to extremely strong effect sizes and correlation coefficients were revealed for each dependent variable.

2.10. SYNTHESIS OF RELATED STUDIES IN ATTITUDE TOWARDS LEARNING OF MATHEMATICS

The findings of other related studies in Mathematics education may be synthesized as follows: Deshmukh Veena, (1988) tried to explore the relationship of mathematics learning with different temperamental variables. It attempts to justify the identification of a certain closelyknit group of personality variables (ten only which may be related with mathematics in the cognitive domain. Hariharan, D. (1992) attempted to find out the attitudes of high school students towards homework and their achievement in mathematics. Rosaly, A. (1992) attempts to find the relationship between attitude of students towards mathematics and achievement. Basavayya, D. (1995) in his study “student’s perceptions of mathematics” attempted to study the awareness of the students about the nature and values of mathematics, the relationship between perception and achievement in mathematics, their parental aspirations regarding mathematics and their perception regarding the school facilities for teaching mathematics. Lalit Kumar (1996) compared the attitude of teachers towards mathematics across gender and also across teachers working in Government and Private schools. The findings of the study made by Jody Ziccardi, Priselac, (1999) offered strong support for the utility of designing professional development models that begin with understanding teachers beliefs about mathematics. Joan J.Nicoletti (2000) studied the effect of instruction and learning style congruence on mathematics achievement attitudes, and behaviour of understanding in chronically misbehaving upper-elementary students in a suburban school district. Fraks, Rhoonda Dawn (2002) in his research explored the effects of traditional versus learning-styles instructional methods on seventh grade students’ achievement, attitudes, empathy and transfer of skills through a study of the Holocaust.
2.11. CONCLUSION

An overall review of the related studies reveal that various studies have been undertaken to explore the possibilities of improving the status of Mathematics. These studies aim at making a comparison of the different methods, devices, principles and techniques in the teaching of Mathematics, finding out problem areas in the teaching and learning of mathematics, testing the results in terms of student achievement, and bringing out suggestions for remedial measures to be followed in Indian classroom situations.

The findings of the above studies reveal that a scientific attitude, a perspective attitude, and participatory learning by the pupils should be included from the primary stage of the pupils. To gain this, the teachers of mathematics should aim at professional excellence by planning their teaching strategies. This will help them to overcome the pitfalls and hurdles of the curriculum and the existing method of teaching and learning.

Laying proper foundation in mathematics at the primary level is the vital job of a primary teacher. The current trend of mathematics education shows a strong need for teacher generated learning activities, learning by doing, discovering and experimenting by the pupils, developing individual, group and whole class work, using the local environment and creating an interesting class room. The present study is an earnest attempt to find out the effectiveness of activity based teaching strategies in enhancing the level of achievement in mathematics at primary level. The above review clearly indicates that there is a need for designing activity based teaching strategies with special reference to the knowledge, understanding and application level of educational objectives. Moreover, studies of this type will be of an immense use to improve the quality of primary education in Mathematics.