CHAPTER - II

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

This chapter comprises research studies related to the present problem. The review of related literature promotes a greater understanding over the problem and its crucial aspects. It provides empirical basis for the subsequent development of hypotheses. It ensures the avoidance of unnecessary duplication and provides empirical basis for the subsequent development of additional dimensions for the present study.

In the words of Good, “The key to the vast store house of published literature may open doors to sources of significant problems and explanatory hypotheses and provide helpful orientation for definition of the problem, background for selection of procedure and comparative data for interpretation of results. In order to be truly creative and original, one must read extensively and critically as a stimulus to thinking”.

The investigator reviewed the studies carefully as it helps in correct conceptualization of the problem and provides greater insight into the problem.
2.2 STUDIES RELATED TO THE PRESENT PROBLEM ARE CLASSIFIED AS UNDER

1. Studies related to Achievement in Mathematics

2. Studies related to Achievement in Mathematics and Intelligence

3. Studies related to Achievement in Mathematics and mathematical creativity

4. Studies related to Achievement in Mathematics and problem-solving ability

5. Studies related to Achievement in Mathematics and gender

2.1 Number Of Studies In Each Category Is Given In The Following Table

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<th>Sl no.</th>
<th>Category</th>
<th>Indian Studies</th>
<th>Foreign Studies</th>
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2.3 STUDIES RELATED TO ACHIEVEMENT IN MATHEMATICS IN GENERAL

The study was undertaken with the following broad objective:

i) To identify a broad group of casual factors related to under achievement in mathematics.

Among other things being equal, the study had revealed the following:

i) The ten variables, self reliance, sense of personal freedom, feeling of belonging, withdrawing tendencies, nervous symptoms, social skills, social relations, community relations, general anxiety and test anxiety were most effective in discriminating between all the achievement pairs. That is, over achievers and normal achievers, normal achievers and under achievers and over achievers and under achievers.

ii) The variable which was least effective in discriminating was anti social tendencies and

iii) The five variables sex, age, cast, parental profession and parental education were associated with all the three achievement levels.

RASTOGI S. (1983) diagnosed the weaknesses in arithmetic as related to the basic arithmetic skills and their remedial measures.

The study was undertaken with the following objectives:

i) To establish a relationship between achievement in mathematics and command over basic arithmetic skills.
ii) To establish a relationship between command over basic arithmetic skills and attitude towards mathematics and

iii) To establish a relationship between achievement in mathematics and attitude towards mathematics.

This study revealed that,

i) One of the causes of backwardness in mathematics was the poor command over basic arithmetic skills.

ii) Attitudes were closely linked with achievement.

iii) When command over basic arithmetic skills improved, attitude towards mathematics become more favorable and achievement in mathematics increased.

iv) There were no significant sex differences in either attitude towards mathematics or achievement in mathematics.

**Vyas C.S. (1983)** studied the effect of symbol picture logic programme on mathematics achievement.

The main objectives of the study were

i) To study the effectiveness of the symbol picture logic programme on the achievement on mathematics and
ii) To find the effectiveness of the symbol picture logic programme in the context of the variables like parent education and sex.

The findings of the study were:

i) The students of the experimental group who were given a treatment of the symbol picture logic programme showed better achievement in mathematics than the control group of students.

ii) The achievement in mathematics was independent of parent education and sex.

**YADAV P.S.(1984)** identified the effect of mastery learning strategy on pupil’s achievement in mathematics, their self concept and attitude towards mathematics.

The study was undertaken with the following objectives:

i) To compare the mean achievement scores of two groups of pupils taught mathematics with and without the use of mastery learning strategy.

ii) To compare performance scores of two groups of pupils taught mathematics with and without the use of mastery learning strategy.
The study revealed the following points

i) Before the experimental treatment, the experimental group of pupils and the control group of pupils evinced no significant differences in respect of their achievement in mathematics.

ii) After experimental treatment, the experimental group of pupils exhibited a significantly higher achievement in mathematics than the control group of pupils and higher gain scores of achievement in mathematics and

iii) Different percentile achievement scores of the experiment scores of the experimental group of pupils were found to be significantly higher than those of the control group of pupils at post-test stage.

PANDHARI A.S. (1988) identified the study of language, memory and process as factors affecting students’ learning of mathematics in standard XII.

The study was conducted with the following objectives:

i) To study the effect of language, memory and process as factors effecting students’ performance in mathematics in standard XII.

ii) To study the effect of these factors in the following situations (a) Urban Semi-urban, rural institutions (b) ’school attached' and
‘college attached’ junior colleges (c) junior colleges having technical courses and in the ones not having such courses and

iii) To study the effect of these factors namely, language, memory and process, singly and also in combination.

The study revealed that

i) The three factors under consideration, lack of language, memory and process affected students’ learning in mathematics either separately or in combination

ii) All the three factors under study affected students’ learning in mathematics adversely and

iii) The learning outcome of children belonging to urban, non-technical institutions attached to colleges was superior to urban technical institutions attached to high schools.

**JAYARAMAN.V(1989)** attempted to study some correlates of students’ achievement in mathematics at standard X level in Devakottai Educational District.

The main objectives of this study were:

i) To identify the relationship between attitude and achievement in mathematics.
ii) To identify the relationship between attitude towards learning mathematics and hindrances for learning mathematics and

iii) To identify the relationship between achievement in mathematics and hindrances for learning mathematics.

This study revealed that

i) There was an association between attitude towards mathematics and achievement in mathematics

ii) There was a negative association between hindrances for students' learning mathematics and their attitude towards mathematics and

iii) There was a negative association between hindrances for students' learning mathematics and their achievement in mathematics.

**SWEENEY, JOHN DAVID (1989)** identified some factors related to mathematical achievement in Mississippi high schools as measured by scores on the American College Test

The study was conducted with the following broad objective:

i) To determine the relationship between certain variables and scoring high on the ACT in mathematics

This study revealed that
i) Expenditure per student per school, average daily attendance, high school graduation requirements in mathematics and membership in mathematics professional organizations were not related to mathematical achievement of high school students and

ii) Enrollment of schools, number of mathematics courses taught above Algebra I and competition in mathematics contests are related to high achievement in mathematics in Mississippi high schools.

**TOMSIC, LINDA J (1990)** made a study on the relationship among goal accomplishment styles of upper elementary gifted students, their attitude towards mathematics, higher thinking skills and mathematics achievement.

The tools used for this study were the Goal Orientation Index, Ross Test of Higher Cognitive Process and the Mott student survey. The tools were administered to 41 gifted elementary students.

As a result of the study, it was found that although high achievement is expected of gifted students, the causes of high and low achievement in mathematics are complex, the three variables that were tested showed significance in some areas but not in others.
NGAILANKIM, CAROLINE (1991) identified the variables associated with achievement in mathematics.

The main objectives of this study were to find out association between

i) Attitude towards mathematics and achievement in mathematics

ii) Educational and occupational aspiration and achievement in mathematics

iii) Numerical ability, abstract reasoning, space relations and achievement in mathematics and

iv) The various personality factors and achievement in mathematics

This study revealed that

i) There was a significant association between (a) attitude towards Mathematics (b) educational aspiration (c) numerical ability (d) abstract reasoning (e) personality factor and achievement in mathematics.

ii) None of the other variables studied showed association with achievement in mathematics.
HARIHARAN D. (1992) studied the attitudes of high school students towards homework and their achievement in mathematics.

The study was undertaken with the following objectives:

1) To measure the attitudes of high school students towards homework in mathematics.
2) To measure their academic achievement in mathematics and
3) To find out the relationship between the attitudes of high school students towards homework and their achievement in mathematics.

Findings of the study were:

1) Girls were higher than boys in their attitude towards homework.
2) Urban students were higher than rural students in their attitude towards homework and
3) The attitudes of high school students towards homework were related to their achievement level in mathematics.

PONDURAI J. (1992) studied the achievement of students of 10th standard in mathematics in V.O.C Chidambaranar District.

The study was conducted with the following broad objective:

1) To study the relationship between achievement and socio-economic status of 10th standard students in mathematics.

The study revealed that,
i) There was no significant relation between achievement and socio-economic status of 10th standard students in mathematics.

**ROSALY A. (1992)** identified the relationship between attitude of students towards mathematics and achievement. The main objective of this study was to find out the relationship between attitude and achievement in mathematics.

This study revealed that

i) The attitude of high school students towards learning mathematics and their achievement in mathematics were related.

ii) Girls were higher than boys in their achievement in mathematics.

**REID-JOHN (1992)** found out the effects of cooperative learning with intergroup competition on the mathematics achievement of 7th grade students.

The objective of this study was to determine the effect of cooperative learning strategies on mathematics achievement of 7th graders.
The study revealed that Cooperative group learning strategies are more effective in promoting mathematics achievement of 7th graders.

BHATIA, KUSUM (1992) identified the difficulties in learning fractions with programmed instructional material.

The main objectives of the study were:

i) To use programmed instructional material as a remedial tool.

ii) To test the effectiveness of programmed instructional material in classroom teaching for students of class V and

iii) To test the significance of difference between the traditional method of teaching and teaching through programmed instructional material

The study revealed that,

i) Teaching and learning through programmed instruction could definitely help both students and teachers.

ii) Students receiving the programmed instructional material did better in post test as compared to the other group

iii) The PIM worked effectively as a remedial tool and
iv) PIM not only helped the students to learn better but also helped the teachers to know how the students learned better.

**NATHIV AMALYS (1994)** studied the helping behaviors and mathematics achievement gain of students using co-operative learning.

A total of 101 students in grades 3, 4 and 5 were given a 3 week course helping behaviors before being taught mathematics. Concepts in co-operative learning, groups, giving and receiving explanation or other meaningful help were related positively with academic achievement in mathematics.

**STUART MAUREEN A.C (1994)** studied the effects of group grading on co-operations and achievement in two fourth grade mathematics classes. The main objective of this study was to find out the effect of group grading to increase co-operation among group members and mathematics test scores of low achiever.

Findings of this study revealed that, Group grading was more effective with students who enjoyed working in groups and who accepted the method of assessment than with students who did not like group work and preferred individual grades.
**BREHMER-EVANS, KATHLEEN ALYCE (1994)** conducted a study on the effect of the integrated learning system on mathematics achievement.

The purpose of this study was to determine the effectiveness of the integrated learning system on mathematics achievement of second and third grade students in two magnet school programs.

The control group was composed of 78 students attending traditional classes. The experimental group was composed of 62 students who received supplemental instruction in mathematics using an ILS.

The findings of the study revealed that ILS was more effective in improving achievement in mathematics than traditional method of teaching.

**PREMA E.(1995)** investigated the relationship between aptitude and achievement of 12th standard students in mathematics.

The purpose of this study was, to find out the relationship between aptitude and achievement in mathematics.

This study revealed that there was significant positive relationship between the mathematical aptitude and achievement in
mathematics of the respondents studied in terms of boys and girls and urban and rural.

**SATAKE, EIK, AMATO, MPHILIP. P(1995)** studied the mathematics anxiety and achievement among Japanese elementary school students.

The incidence correlates and effects of mathematics anxiety were studied for 154 Japanese children in grades 5 and 6. Factor analysis identified four dimensions of mathematics anxiety, and a number of relationships between achievement test scores and grades, gender and class were also identified.

**DR. CHATUR P. PATEL, (1996)** investigated the interaction effect of general anxiety – Defensiveness and the achievement in mathematics of the secondary school students.

Out of the various factors influencing mathematical achievement, investigator undertook the study of general anxiety – defensiveness and the achievement in mathematics of the secondary school students and found that general anxiety group and high defensiveness group shows better performance in mathematics. Also sex plays a role on achievement score in mathematics, i.e., the boys do better in achievement than the girls in the subject of mathematics and
there was significant interaction effect of anxiety and defensiveness, anxiety and sex on the achievement in mathematics.

**DR. JAYESH A NAIK (1997)** conducted a study on “Developing and Trying-out Inductive Model of Teaching in Mathematics to develop student’s reasoning ability.

Objectives of the study were:

i) To develop the reasoning ability of the pupils by using ITM

ii) To compare the use of ITM over the traditional method in developing inductive thinking

iii) To try out the efficiency of ITM in terms of the achievement of pupils.

Pre-test, post-test design was used for the experimentation and 125 students were chosen for their inclusion in the sample.

Findings of the study were:

i) ITM has been found effective in increasing reasoning ability.

ii) ITM was found more effective than traditional method of teaching.

iii) ITM was found effective in terms of the achievement of pupils.
PANDA B.N.(2000) studied the factors effecting the pupils achievement in primary schools of Orissa.

The study was conducted with the following objectives:

i) To find out the present academic performance of the urban primary school students in different school subjects.

ii) To find out the present academic achievement of status of tribal primary school students in different school subjects.

iii) To find out the influence of home factors on academic achievement of rural, urban and tribal primary school students in the state of Orissa.

iv) To find out how school related and teacher characteristics effect academic achievement among rural, urban and tribal primary school students who have continuously completed classes I to IV and continuing class V in different school subjects.

This study revealed that,

i) Boys and girls studying in different areas did not differ in their performance in all the school subjects

ii) Non SC/ST students performed better in mathematics as compared to their counterparts in rural areas.
iii) Children of college educated fathers had shown better achievement in mathematics.

iv) Students studying in urban schools had shown better performance in mathematics in schools where PG trained mathematics teacher taught the subject.

v) Home task given and correction by the teacher had significant effect on enhancing learning achievement in all the school subjects in rural and urban areas but not in tribal cases and

vi) Rural and Tribal students performed better in all the school subjects where the teachers were regular and committed to school but such teacher behavior affected only mathematics and general science achievement in case of urban students.

**MEHERA C. (2004)** studied some of the determinants of achievements at secondary level.

The main purposes of this study were:

i) To assess the students’ achievement in mathematics (AM), the nature of Major learning environments (MLE), Scientific attitude (SAT) and Attitude Towards Subject Mathematics (ATS).

ii) To determine the inter-correlations among the scores in AM and those in MLE, SAT and ATS.
iii) To find out gender-wise and strata-wise differences, if any, in AM as well as in MLE, SAT and ATS.

iv) To compare the achievement in mathematics of the groups of students having high and low MLE, SAT and ATS respectively and

v) To estimate the combined efficiency of MLE, SAT and ATS in predicting students’ achievements in mathematics.

The finding of the study were,

i) Achievement in mathematics was significantly related to major learning environment, attitude towards subject mathematics,

ii) Urban students showed significantly higher achievement in mathematics, better learning environment and better attitude towards mathematics than their rural counterparts.

iii) No sex-wise difference was found in achievement of students in mathematics, regarding the enjoyment of learning environments of students and the attitude of students towards mathematics.

iv) No strata-wise and sex-wise difference was found in the scientific attitude of students.
v) The high-scoring group of students in MLE showed significantly higher achievement in mathematics than their low scoring counterparts.

vi) The high-scoring group of students in SAT showed significantly higher achievement in mathematics than their low-scoring counterparts and

vii) MLE, SAT and ATS taken together were good predictors of the achievements of students in mathematics.

SIM, SUSAN (2004) investigated the role of technology (computer) in the instructional procedures applied in the classroom and the impact of this technology on students’ achievement.

This study revealed that,

i) Secondary school mathematics teachers expressed highly different levels of agreement concerning how the use of educational technology could be implemented in the classroom instructional procedures along with its potential impact on student achievement. This large variability in perceptions might be attributed in part to the fact that the majority of instructors used technology less than 20% of the time in their instructional
procedures, suggesting a lack of familiarity with technology and its applications in classroom learning.

ii) Perceptions regarding the use of educational technology in the classroom setting tend to be centered on its provision for alternative approaches to instruction and to the enhancement of motivation for learning in conjunction with its being a tool of convenience and

iii) A perceived need exists for greater funding and improving inservice training opportunities from state agencies.

**EISENHAUER, BRENDA (2005)** designed this case study to identify attributes that ninth-grade, African–American male students describe as helping or hindering their achievement in Algebra.

This study reinforced the fact that,

i) We must look seriously at student-teacher relationships and how teachers are trained to instruct and communicate with students. In order for African-American males to be effectively educated, they must feel respected, understood and valued.
ii) We must begin by ascertaining how individuals arrive at how they interpret the world, their roles, and people around them.

iii) If we are to move towards impacting student achievement, teachers need to understand and interpret the symbols, perspectives and definitions of how students define their world and how they view their relationships with teachers, beginning in early elementary school. Early on throughout elementary school, a bonding process must take place first, which results form love, respect and understanding.

**STEVEN B. SHELDEN & JOYCE L. EPSTEIN (2005)** examined the link between family and community partnerships and mathematics achievement.

The main objective of this study was to examine the connections between specific family and community involvement activities and students achievement in mathematics at the school level.

The study revealed that,

i) Effective implementation of practices that encouraged families to support their children's mathematics learning at home was associated with higher percentages of students who scored at or
above proficiency on standardized mathematics achievement tests.

ii) Subject specific practices of school, family and community partnerships may help educators improve students’ mathematics skills and achievement.

LOKNATH MISHRA (2005) identified the causes of low achievement in mathematics of class IV students in Dhenkanal District.

The study was conducted with the following main objectives:

i) To identify the causes of low achievement of class IV children in mathematics in Dhenkanal District and

ii) To suggest remedial measures to improve the students’ achievement in mathematics.

This study revealed that,

i) The students’ engagement in domestic work and non-availability of adequate time for practice at home is one of the causes for low achievement.
ii) Lack of understanding in some areas (fraction, decimals, LCM, GCF and factors) of mathematics impacts students' achievement negatively.

iii) The occasional correction of homework is one of the causes of low achievement in mathematics.

iv) As stated by the teachers, the difficult and heavily loaded syllabus is one of the causes of low achievement and

v) Regular homework practice by students, use of teaching aids and regular homework and correction work are the remedial measures which have the potential to enhance the level of students' achievement.

**HOLAWAY-JOHNSON, CALLI ANN (2006)** studied the best practices that middle schools are using to help students achieve in mathematics.

Five high performing and seven average performing schools in Northwest Arkansas were identified. Principals, mathematics coaches and classroom teachers at the selected schools were interviewed.

The findings of the study are revealed that,
i) High performing schools show more congruity between teachers and administrators and have implemented effective practices for longer periods of time.

ii) Differences between school configurations were only found in the areas of instructional strategies and professional development.

iii) Teachers in schools that only test grade 6 are more likely to collaborate and to apply professional development directly to the classroom than teachers in other configurations and

iv) In addition, teachers in schools that test only grade 8 are more autonomous and prefer to use direct instructional techniques.

**NASEEMA C. AND USHA V. (2007)** comparatively studied the school adjustment, self-concept and achievement in mathematics of visually impaired and normal secondary schools pupils in the integrated system.

The main objective of this study was to measure whether there is any significant difference in the achievement in mathematics and in the psychological variables like school adjustment and self concept between the visually impaired and normal secondary school pupils.
This study revealed that, there exists significant difference at 0.01 level between visually impaired and normal pupils in respect to their school adjustment, self-concept and achievement in mathematics.

**USHA P.(2007)** studied emotional adjustment and family acceptance of the child and correlative for achievement.

The study was conducted with the purpose to find out the extent of relationship between emotional adjustment and family acceptance of child and academic achievement in mathematics.

The findings of the study were,

i) There exists a significant relation between emotional adjustment and achievement and also with family acceptance of the child achievement.

ii) No significant difference was noticed between emotional achievement of boys and girls.

iii) Urban pupils were found superior to rural pupils in their emotional adjustment, family acceptance and achievement.
2.4 STUDIES RELATED TO ACHIEVEMENT IN MATHEMATICS AND INTELLIGENCE

RAO D.G (1965) studied some factors related to scholastic achievement of the grade VIII pupils of Delhi.

The main objectives of the study were:

i) To find out the relationship of intelligence, study habits, socio-economic status and certain attitudes towards the school with the academic achievement of the grade VIII pupils of Delhi and

ii) To find out the feasibility of predicting the academic achievement of these students.

This study revealed that,

i) The three independent variables- intelligence, study habits and school attitude were significantly related to the prediction of scholastic achievement while socio-economic status was not.

ii) The variables intelligence, study habits and attitude towards school accounted for 66% of the predictability of scholastic achievement and remaining 34% of the variance in achievement remained to be accounted for socio-economic status.
LALITHAMMA K.N (1975) made a study on some factors affecting achievement of secondary school pupil in mathematics.

The study was undertaken with the following objectives:

i) To carry out different studies on interest, achievement and intelligence based on sex, locality etc.,

ii) To find out relationship to study habits, social-economic factors, intelligence and interest with achievement in mathematics.

Samples were 732 students of 9th standard selected on a stratified random basis. The tools used were a standardized achievement test in mathematics, a study habit inventory, an interest inventory, a socio-economic status scale and the Raven's standard progressive matrices.

The findings of the study revealed that,

i) There was significant difference in the performance of boys and girls in mathematics, the difference being in favor of boys.

ii) Intelligence and interest in mathematics were higher in boys than in girls.

iii) The achievement in mathematics was positively related to intelligence, interest in mathematics, study habits and socio-economic status.
RAO T.G. (1983) identified the efficiency of the programmed learning method over the conventional learning methods in the instruction of mathematics.

The main objectives of this study were:

i) To investigate into the variations in achievement gains of the pupils in mathematics owing to variation in their general mental ability level under programmed learning instruction.

ii) To find out the differential learning gains in the pupils owing to school climate, with special reference to private and Government management of institutions.

This study revealed that

i) The learning gains in mathematics were maximized by the programmed learning in the case of subjects of urban private schools

ii) The girls of the private schools, irrespective of their stage of instruction, scored higher than the boys by programmed learning method of instruction in mathematic, though these differences were not found to be significant.
iii) Subjects of high general mental ability of private schools were the highest beneficiaries of the programmed learning method of instruction in mathematics.

**RAJPUT A.S (1984)** conducted a study on, Academic achievement of students in mathematics in relation to their intelligence, achievement, motivation and socio-economic status.

Objectives of the study were:

i) To study the impact of intelligence at various levels of the achievements of students in mathematics.

ii) To study the interaction effects of variables of intelligence, achievement motivation and socio-economic status on the achievement of students in mathematics.

Study was conducted on a sample of 435 students of grade V from various central schools. The findings of the study were

i) Intelligence affected the achievement of students in mathematics significantly at all the three levels.

ii) High intelligent group were superior in achievement than average and low intelligent groups, average intelligent group
were better achievers in mathematics than the low intelligent group.

iii) The double and triple interaction effects between the variables of intelligence, achievement motivation and socio-economic status were not significant.

**CHITKARA M. (1985)** conducted a study on the effectiveness of different strategies of teaching on Achievement in mathematics in relation to intelligence and sex.

The objectives of the study were to find out:

i) Whether different strategies had different effects on achievement of male and female students.

ii) Whether levels of intelligence interacted with teaching strategies in terms of achievement.

In the study a pretest/post test experimental design was followed. A four-way factorial design (3x2x2x3) was employed.

A sample of 300 students was randomly selected from grade IX students. The tools administered were,

i) The mathematical achievement test,

ii) The Jalota group test of mental ability,
iii) Students were divided into three groups of 100 each and was taught through lecture discussion, inductive-drill method and auto instruction, group discussion strategies respectively.

Findings of the study were,

i) All the three strategies namely lecture-discussion, inductive drill and auto-instruction, group discussion were found to be equally effective in terms of achievement in mathematics disregarding levels of intelligence, sex and personality type.

ii) Boys and girls of superior ability did not show any significant difference in their mean scores on achievement in mathematics.

iii) Out of the three strategies, lecture-discussion was more suited for below average ability extroverts and introverts; inductive-drill for high ability extroverts and auto instruction group discussion was most suited for high ability introverts for achievement in mathematics.

SINGH B. (1986) made a study on some possible contributing factors to high and low achievement in mathematics of the high school students of Orissa.

The hypothesis tested was:
Achievement in mathematics is significantly related with intelligence, scientific interest, mechanical interest, study habits, study attitudes and socio-economic status.

Sample was drawn by the principle of simple randomization using random numbers, thus consisted of 370 subjects.

Tools used for the study were:

i) An achievement test in mathematics developed by the investigator.

ii) Cattell’s Culture Fair-intelligence Test

iii) Samal’s Socio-economic status scale

iv) Survey of study habits and attitude(SSHA) form H

v) Samal’s Vocational interest inventory (VII), were used to collect data.

Findings of the study were:

i) Achievement in mathematics was positively significantly related with intelligence, SES, study attitudes.

ii) Achievement in mathematics was not related with scientific interest, mechanical interest and study habits.

TRIPATHI, P.(1987) comparatively studied the correlates of academic attainment of pupils of junior high school.
The main objectives of this study were:

i) To make a comparative study of the average scores of the students (belonging to rural and urban institutions managed by various agencies) in three selected correlates—intelligence, socio-economic status and educational facilities.

ii) To make a comparative study of the academic attainment of students in mathematics and

iii) To estimate the amount of contribution made by the above correlates to the success of students in the above test at the junior high school level.

This study revealed that

i) The average level of scores in all the selected correlates (Int, SES and EF) and academic achievement were found to be low.

ii) Urban boys of private institutions had secured comparatively better scores in achievement test than their rural counterparts.

iii) Urban boys and girls had secured higher marks in mathematics than their rural counterparts.

iv) All the three correlates had a significant positive relationship with academic attainment and
v) SES and EF made a remarkable contribution to the academic success of both boys and girls.

**MILLER, SANDRA FISHER (1991)** conducted study of the relationship of mathematics anxiety to grade level, gender, intelligence and mathematical achievement.

Objectives of the study were:

i) To determine the relationship between mathematics anxiety and grade level, gender, intelligence and mathematical achievement in elementary (4th-6th) and junior high (7th-8th) students.

216 subjects selected for this study from a private K-8 school in the Mid-South region of the country. Tools used in the study were:

i) Mathematics Anxiety Rating scale

ii) Otis-Lennon school Ability test

iii) The Stanford Achievement test

iv) Mathematics averages were obtained for each subject.

Results of this study did not confirm that mathematical anxiety is correlated with grade level, gender, intelligence or mathematical achievement.
2.5 STUDIES RELATED TO ACHIEVEMENT IN MATHEMATICS AND MATHEMATICAL CREATIVITY

MULK RAJ TULI (1979) made a study on Mathematical creativity as related to aptitude for achievement in mathematics.

The study was conducted on a sample drawn from 9th grade high school students. The sample was selected by employing the techniques of multistage randomization of cluster at district, block and school levels. The research tools administered were Balka creative ability in mathematics test, numerical ability test, verbal reasoning test, abstract reasoning test and a revision of different aptitude test for higher secondary schools by Ojha. The examination marks served as criterion of achievement in mathematics and academic excellence.

The factor analysis technique and regression analysis were used to analyze the data. Beta weights were used to identify factor structure of mathematical creativity.

The findings of the study confirm the hypothesis that mathematical creativity is significantly related to attitude for mathematics and mathematical creativity contributes significantly towards achievement in mathematics.
Dr. S.C. GAJKHAR (1985) did a regression analysis of Intelligence, creativity and achievement in mathematics.

The hypotheses of the study were:

i) There is significant correlation between measures of intelligence and creativity taken singularly on one side and achievement in mathematics on the other side.

ii) Intelligence and achievement in mathematics free from creativity and also creativity and achievement in mathematics free from intelligence remain significantly correlated.

iii) Intelligence and creativity are equally good predictors of achievement in mathematics.

A sample comprising of 170 students of 9th class were selected on the basis of multi-staged randomization of clusters.

The tools used for the study were, Jalota (1972) group test of mental ability, Torrance test of creative thinking verbal form A, Mid-term Examination marks were considered as achievement scores in mathematics.

For analysis of data, raw scores of creativity were converted into standard scores with mean = 50 and SD = 10. Correlation, partial
correlation and regression techniques were employed to analyze the data.

The findings of the study were:

i) There is significant correlation between measures of intelligence and creativity and achievement in mathematics.

ii) Intelligence and creativity are good predictors of achievement in mathematics.

iii) Even if the intelligence has been partialled there is significant +ve correlation between creativity and achievement in mathematics.

iv) Similarly if creativity has been partialled there is significant +ve correlation between intelligence and achievement in mathematics.

v) In multi-variate analysis, the conjoint effect of intelligence and creativity is higher as compared to their respective predictions in respect of mathematical achievement.

**BISWAL, J. (1988)** studied the creativity in mathematics as a function of study habits and pupils’ perception of teachers’ impression about their performance in mathematics.

The main objectives of this study were:
i) To determine the efficiency of pupils’ study habits in mathematics and their perception of teachers’ impression about their performance in mathematics.

ii) To estimate the combined efficiency of pupils’ study habits in mathematics and pupils’ perception of teachers’ impressions about their performance in mathematics and their mathematics achievement scores in predicting their mathematical creativity.

iii) To assess the effects of sex, caste, rural, urban local, birth order, home study time for mathematics, rank in class mathematics test and self assessment of achievement in mathematics on pupils’ creativity in mathematics.

The study revealed that:

i) A functional relationship was also found to exist between pupils’ creativity in mathematics and the combination of study habits in mathematics, pupils’ perception of teacher’s impressions about their performance in mathematics and achievement in mathematics. The multiple correlation was positive and statistically significant, Thirty two percent of the total variation in mathematical creativity measures was attributable to the joint variation of the measures of the
predictors: achievement in mathematics accounted for about 28% of the variation in criterion measures.

ii) Urban students were found more creative in mathematics than their rural counterparts.

iii) Creativity in mathematics varied directly with the increase in the time devoted to studying mathematics at home from one or less than one hour to two hours.

iv) Pupils who got the first four ranks in mathematics tests were found more creative in mathematics than their remaining classmates.

**FOUCHE, KATHERYN KIRK (1993)** conducted a study on problem solving and creativity: Multiple solution methods in a cross cultural study in middle level mathematics.

The purpose of the study was:

To investigate the solution methods employed by middle level students engaged in solving non routine mathematical problems and the role of creativity during the reflection process.

The solution methods of students who participated in problem-solving sessions designed to elicit multiple solutions for non routine
mathematical problem were compared to methods employed by students who received no such deliberate practice.

The major findings of the study suggest that both the number of solution methods students were able to generate for a single non routine mathematical problem and the level of complexity of those methods were significantly increased when students were given the opportunity to engage in reflective problem solving activities.

The number of solution methods students were able to generate for a single non routine mathematical problem was positively related to their measure of creativity.

2.6 STUDIES RELATED TO ACHIEVEMENT IN MATHEMATICS AND PROBLEM-SOLVING ABILITY

SMITH, BARBARA FOWLER(1988) conducted an investigation of the efficiency of a heuristic problem solving performance of eight grade mathematics students grouped by creativity and treatment level.

Purpose of the study:

The effect of a problem solving training course had upon the mathematical problem solving performance of 225 eight grade
students grouped by creativity and treatment was the basis for this study in rurally based junior high schools.

The study was a combined one and two way quasi-experimental design with analysis of co-variance using intelligence as a co-variant.

Findings of the study were:

i) Problem solving training was shown to produce improvement in mathematical problem solving performances in 8th grade students without regard to creativity grouping.

ii) In 8th grade students grouped high and low in creativity, students high in creativity scored higher in problem solving performance than students low in creativity even when intelligence was removed as a factor.

iii) Interaction of creativity and problem-solving training was not significant.

**MAYES, ROBER LEE(1989)** compared the effects of programming and software application on mathematical problem-solving in secondary schools.

The main objective of this study was to research the effects of the use of software tools and computer programming on mathematical problem solving in the secondary mathematics classroom.
This study revealed that

i) Computer treatment was not supportive for low level mathematics students

ii) The computer treatment was supportive for medium level mathematics students and

iii) For the high level mathematics students no treatment was needed in problem-solving.

**MOLEFE, JACO KGABUDI (2004)** investigate the effect and role that culturally relevant problem solving in the language of their choice may have on learning mathematics.

The study revealed that,

i) The majority of the participants, preferred to communicate their mathematics thoughts in a mixture of English and their first language

ii) They solved problems they could not solve before using own strategies. These strategies differed from person to person and

iii) Culture had an influence on the type of strategy to be used and the solution of the problem.
AYODHYA P.(2007) attempted to blend problem-solving skills to learner’s achievement

The main objectives of this study were:

i) To know the impact of problem solving instruction through Polya’s heuristic approach on the achievement of mathematics and

ii) To know the correlation between the problem-solving skills of the students and their achievement.

This study revealed that

i) There is significant improvement in the problem-solving skills of the students who were exposed to Polya’s four-step process to solve problem

ii) There is significant improvement in the scholastic achievement in mathematics in the majority of the schools that were exposed to the Polya’s method.

iii) The improvement in the problem-solving skills of the learner might contribute to the improvement in their scholastic achievement in mathematics and

iv) There is a substantial correlation between problem solving skills and achievement of the students in mathematics.
2.7 STUDIES RELATED TO ACHIEVEMENT IN MATHEMATICS AND GENDER

KATIYAR(1979) conducted a study on cognitive functions in relation to achievement in mathematics at high school stage.

Objectives of the study were:

i) To isolate cognitive functions that influence achievement in mathematics.

ii) To find out the factors responsible for the functional relation between cognitive functions of boys and girls.

Sample consisted of 1000 students from X standard. The tools used were 5 tests on cognitive functions. The data was analyzed with the help of mean, standard deviation, regression co-efficient and factor analysis.

Findings of the study are:

i) There is no significant difference in the average scores of Boys and girls studying advance mathematics on the achievement tests.

ii) Girls with advanced mathematics course scored better on the test of cognitive functions.
iii) The factor loadings that numerical reasoning and numerical ability occupied prominent paces among the five cognitive functions.

**NGAILANKIM, CAROLINE (1988)** investigated attitude and study habits related to achievement in mathematics of class 9th students in shilong.

The main objectives of this study were:

i) To find out differences in attitude towards mathematics of students with high, average and low mathematics achievement and

ii) To find out the differences in study habits of students with high, average and low mathematics achievement.

This study revealed that:

i) No significant difference was found in the attitude towards mathematics of students grouped high, average and low on mathematics achievement.

ii) Male and female students belonging to high, average and low scores on mathematics achievement did not show significant difference in their attitude as well as study habit scores and
iii) Non-tribal students showed significantly higher attitude scores as well as higher achievement score on mathematics, but did not show significant difference in their study habit scores as compared to the tribal students.


The study was conducted with the following main objectives:

i) To study the relationship of mathematics learning and temperamental traits and

ii) To study the temperamental factor structure of high, average and low achievers as well as of over, normal and under achievers in mathematics.

The study revealed that,

i) A low but positive and highly significant correlation was found between mathematics learning and responsible and ascendant temperaments.

ii) A low but negative and highly significant correlation was found between mathematics learning and temperamental dimensions, like sociable, accepting and impulsive, which means the negative ends of these traits.
iii) 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.

iv) The temperamental profiles of high, average and low achievers were found to differ considerably from one another.

v) The high achievers were found to be more critical, more responsible, more solitary and more ascendant than the average achievers, who were tender minded.

**PAL, ASUTOSH (1989)** critically studied some effective outcomes of the students as predictors of their mathematical ability.

The main objectives of this study were:

i) To find out their relation to students’ achievement in mathematics, sex-wise, stratum-wise and

ii) To fit a regression equation so that prediction of achievement in mathematics can be made.

This study revealed that,

i) Boys showed higher self-concept than girls and

ii) There existed significant correlation between mathematics achievement and self-concept between mathematics
achievement and anxiety, between mathematics achievement and attitude, between mathematics achievement and academic motivation.

**LEWELLYN, RONALD JAMES (1989)** investigated gender differences in achievement, self efficacy & anxiety.

This explanatory research proposed following major questions.

1) Will there be a significant gender differences in mathematics achievement?

2) Will females demonstrate more mathematics anxiety than males?

3) Will females tend to have lower self-efficacy estimates than makes for mathematics achievement?

Sample was comprised of 241 adolescent’s. The adolescents were compared using the Mathematics Anxiety Rating Scale for Adolescents (MARS-A). Self Efficacy Questionnaires, Arithmetic sub test of the wide Range Achievement.

The findings of the study were:

1) Females out performed males on the dimensions of mathematics achievement.
2) No gender differences were found for mathematics anxiety, self-efficacy and attributions.

**HINES, H. EARL (1989),** did a meta-analysis on the gender-related differences in mathematics participation and achievement.

Objective of the study was:

i) To determine the magnitude and direction of gender differences in mathematics achievement and participation.

In order to determine the above, 30 studies were collected and included in a quantitative synthesis, 260 effect sizes were calculated using statistical data taken from the 30 retrieved studies. A mean study-weighted effect size was calculated for each study and an analysis of variance (ANOVA), with the level of significance of the impact of each coded variable on the mean study-weighted effect size.

Findings of the study were:

i) Gender differences in mathematics achievement and participation among elementary school students are virtually nonexistent.

ii) Gender differences in mathematics among secondary school students while usually favouring males, are small to negligible and statistically insignificant.
iii) Gender differences in mathematics participation among secondary school students suggest a male advantage but further study is needed to determine the magnitude of the difference and the significance of its impact on achievement.

KOHR-RHICHARD-L and Others (1989) studied the relationship of race, class and gender with mathematics achievement for fifth, eighth and eleventh grade students in Pennsylvania schools.

The main objectives of the study were:

i) To study student’s socio-economic status, race and gender as related to mathematics achievement in fifth, eighth and eleventh graders.

The study revealed that,

i) At all three levels, 5th grade whites scored higher than blacks and achievement varied directly with socio-economic status levels.

ii) There were no replicable gender differences.

WARRICK, PAMELA DIANNE (1989), investigated the PASS Model (planning, Attention, simultaneous, successive) of cognitive processing and mathematical achievement.
The purpose of this study was:

i) To examine sex difference in mathematics achievement and cognitive processing.

ii) To determine which of the four PASS components would be the best predictors of achievement in three areas of mathematics (math concepts, problem solving and computation)

The subjects were 208 public school students. All subjects were individually administered 12 experimental tasks based upon the Theoretical components of PASS and were also group administered the mathematics portion of the Metropolitan Achievement Test.

i) The results demonstrated no significant sex differences in mathematics achievement.

ii) There was significant relationship among the PASS component and mathematics achievement.

iii) Mathematics achievement was best predicted by simultaneous processing followed by attention.

DR.S.SUNDARARAJAN AND MR.K.J.SRINIVASAN (1990) conducted a study on higher secondary students attitude towards the study of mathematics and their achievement in it.

Objectives of the study were:
i) To find out if there is any significant difference between the higher secondary boys and girls in respect of their attitude towards mathematics.

ii) To find out if there is any relationship between the higher secondary students attitude towards the study of mathematics and their achievement in it.

Sample was composed of 469 higher secondary students studying mathematics as one of the elective subjects. Attitude scale prepared by the investigator was administered and final examination marks were collected as achievement scores.

The findings of the study were:

i) The higher secondary girls have a more favourable attitude towards the study of mathematics than the higher secondary boys.

ii) There is a significant and positive correlation between the higher secondary students attitude towards the study of mathematics and their achievement in it.

CYNTHIA, TOCEL (1991) made a study on achievement parental support and gender differences in attitudes towards mathematics.

Objectives of the study were,
i) To find out the relationship between attitudes towards mathematics and gender.

ii) To find significant interaction effects among gender achievement and parental support on attitudes towards mathematics.

3,846 adolescents from US and 3,528 adolescents from Thailand who participated in the second international mathematics study constituted the sample, selected on the basis of stratified random sampling technique.

The descriptive statistics and multivariate general linear model technique were employed for analyzing the data.

The findings of the study are:

i) Gender had a significant main effect on attitude towards mathematics,

ii) Achievement and parental support variables had significant inverse relationship with other 3 attitudes.

The main objective of the study was, to estimate gender and socio-economic status effects on reading and mathematics achievement for a sample of 2nd and 5th graders.

This study revealed that:

i) Boys learned significantly more in mathematics, whereas girls learned more in reading.

ii) Instructional time allocations were not significantly related to gender and

iii) Socio economic status minimally affected learning efficiency.

TOCCI, CYNTHIA (1991), did a study on attitude towards mathematics related to gender, achievement and parental support of adolescents from different social classes in the United States of Thailand.

The purpose of the study was:

i) To investigate gender difference in attitude towards mathematics of adolescents.

ii) To examine the relationships between gender and attitudes towards mathematics, achievement and attitude towards mathematics and perceived parental support and attitude
toward mathematics within each social class were also examined.

This study used data from 13-year-olds in the United States and Thailand. Tools used for collection of data were, mathematics self concept scale, mathematics & society, mathematics as a male domain and mathematics anxiety scale. A student's social class was determined by a self-report measure of the father's occupation.

The findings of the study were:

i) There are some important gender differences and similarities with regard to attitudes toward mathematics even when achievement and parental support are controlled.

ii) Achievement has a positive relationship with the sex-typing of mathematics whereas parental support does not.

SEGARS, JAMES DEWARD (1994), did a study on the selected factors associated with eighth-grade mathematics achievement.

The variables examined in relationship to eighth-grade mathematics achievement were:

1. Method of instruction
2. Student ability
3. Gender
4. Number of hours spent per week on mathematics homework
5. Number of hours spent per week on all homework
6. Students attitude toward mathematics
7. Socio economic level of student and
8. Student absences.

Data were obtained from eighth – grade students in two school
districts in north -west Alabama.

Several statistical analyses were employed, including correlation
analysis, regression analysis two – way analysis of variance.

The findings of the study were:

i) Eighth – grade mathematics achievement was found to be
positively related to student ability and negatively related to the
number of student absences per year.

ii) The results of the regression analysis indicated that
mathematics achievement was attributed to the group and
gender.

iii) When the variables of group and gender were excluded from
additional analysis none of the independent variables in the
regression analysis were found to be statistically significant
predictors of eight – grade mathematics achievement.
MANGER, TERJE(1995) identified the gender differences in mathematics achievement at Norwegian elementary school level.

The main objective of this study was to investigate the gender and mathematical achievement of third grade Norwegian students.

The study revealed that,

i) Boys had higher test scores, but the effect size was small

ii) Boys performed better in numeracy, mental arithmetic and measurement problem and

iii) Marked gender differences were found at extreme trails of the distribution.

2.8 STUDIES RELATED ACHIEVEMENT IN MATHEMATICS AND SYLLABUS

No Indian or foreign studies throws light on achievement of students in mathematics in relation to the different syllabus patterns they are studying.
2.9 SYNTHESIS OF THE STUDIES

From the results of reviews, it could be observed that the following factors contribute significantly towards the achievement in mathematics.


- **Attitude towards mathematics and basic arithmetic skills** (Rastogi S.1983; Yadav P.S. 1984; Jayaraman V. 1989; Rosaly A. 1992; Mehera C. 2004; Loknath Mishra 2005)

- **Factors like language, memory and process in Urban and rural institutions** (Pandhari A.S 1988; Panda B.N 2000)

- **Higher thinking skills and attitude** (Tomsic, Linda J 1990)

- **Abstract reasoning, numerical ability and personality factors** (Ngailiankim, Caroline 1991; Katiyar 1979)

- **Attitude towards home work** (Hariharan D. 1992)

- **Co-operative learning strategies** (Reid-John 1992; Stuart Maureen A.C 1994; Nathiv Amalys 1994)

- **Programme learning and instruction material** (Bhatia, Kusum 1992; Rao T.G 1983)
Integrated learning system (Brehmer-Evans, Kathleen Alyce 1994)

Mathematical aptitude (Prema E. 1995)

Inductive Model of teaching and technology based teaching (Dr. Jayesh A. Naik 1997; Sim Susan 2004)

Role of family and community in developing math skills (Steven B Shelden and Joyce L Epstein 2005; Usha P 2007)

Intelligence (Rao D.G. 1965; Lalithamma K.N 1975; Rajput A.S 1984; Chitkara M. 1985; Singh B 1986; Miller, Sandra Fisher 1991)

Socio-economic status (Rao D.G. 1965; Rajput A.S. 1984; Singh B. 1986; Tripathi P. 1987)

Study habits (Rao D.G. 1965; Biswal J. 1988; Ngailiankim, Caroline 1988)


Schools in urban and rural set up (Tripathi P. 1987)
Mathematical creativity (Mulk Raj Tuli 1979; Dr. S.C Gakhar 1985; Biswal J 1988; Fouche, Katheryn Kirk 1993)

Problem-solving ability (Smith, Barbara, Fowler 1988; Mayer, Rober Lee 1989; Fouche, Katheryn Kirk 1993; Mo Lefe, Jaco, Kgabudi 2004; Ayodhya P. 2007)

CONCLUSION

The studies presented in this chapter are reviewed from different angle. In many studies it is observed that factors such as social skills, test anxiety, basic arithmetic skills, attitude and aptitude in mathematics play a major role in achievement in mathematics. Majority of the studies show that there is significant difference in gender with respect to achievement in mathematics. It is discovered from the studies that the intelligence is one of the popular predictor of achievement in mathematics, but some studies reveal that even low intelligent students can improve their performance in mathematics when they are given different treatment and experiences by using different methods of teaching. Very few studies have shown that variables such as, personality, Mathematical creativity, problem-solving ability etc have also effect on achievement in mathematics. The
overall analysis of the review illustrates that most of the studies contain only the main effect of the factors influencing achievement in mathematics. None of the studies either Indian or Foreign throws light on the achievement in mathematics of students studying in different syllabus patterns. It is also evident from the review that none of the studies have been undertaken in local set up. It is also identified that, the interaction effects of certain variables on achievement in mathematics of students when they are classified according to their syllabus patterns such as state syllabus, CBSE and ICSE syllabus are not studied. Hence the investigator felt the need to carry out research on the interaction effect of intelligence, mathematical creativity and problem-solving ability on achievement in mathematics of 9th standard students studying in state, ICSE and CBSE schools in Bangalore District.