Chapter - 2

Review of Related Literature
REVIEW OF RELATED LITERATURE

Introduction:

The review of the literature helps an investigator to get into the frontiers of knowledge that are related to his area of interest. According to Millar (1965) research workers must be aware of what is known with some degree of certainty what is accepted as truth by some and not by others, must have some link of the nature of unexplored areas where additional research should be conducted. The review involves locating, realizing and evaluating research reports as well as reports of observation and opinion that are related to the individuals planned research project. As such the investigator can not have an insight into the problem to be investigated, unless and until he learnt what other have done and what remains to be done in a particular area of interest. Thus, the related literature, besides forming one of the early chapters in the research report for orienting the readers, also serves some other purposes which are given by Good, Barr and Scates as follows.

i) To know whether the evidence already available solves the problem adequately without further investigation and thus to avoid the risk of duplication.

ii) To provide idea, theories explanations or hypotheses valuable in formulating the problem.

iii) To suggest methods of research appropriate to the problem.

iv) To locate comparative data useful in the interpretation of results and.

v) To contribute to the general scholarship of the investigator.
Justification of Literature

The researcher has tried to find out the needed studies in the area of math achievement, gender, attitude, T.V. and Sports, socio economic status and School factors and during his hunt for related literature. It was found that there was no study available which was parallel to the present study. All studies had other different combination of variables or were taken at different levels and on different sample.

In the light of the importance attached of related literature, the investigator high lights briefly the significance of research in secondary education and summarises the relevant studies that have been conducted in this area.

Secondary education has received a global attention in the recent and the past. However, the research in this priority sector of education has mostly remained confined within the developed countries and especially in USA and U.K. till the nineteen sixteen. As regards to developing countries and particularly in India, research in secondary education is not providing a healthy sign.

The present chapter attempts at reviewing the related literature in the domain of mathematical achievement, with special reference to secondary schools students and variables under study. Prediction of mathematical achievement has been occupying a central position in the educational sphere. Prediction of math achievement of secondary schools students through some biographical characteristics (personal and familial) and schools factors has been studied. In this chapter, an attempt has been made to review the related literature under the following headings -

A- Studies related to math achievement and personal factors of students.
B- Studies related to math achievement and familial factors of students.
C- Studies related to math achievement and institutional factors of students.

2.1 Relationship between math achievement and personal factors of students

2.1.1 Gender and math achievement

Thakur (1972). A sample of 780 science studying students of class XI during the academic session of 1965-1966 were selected from different schools of Bihar.

The Major Findings

1. The group performance in all the branches of scholastics achievement did not differ significantly.
2. The group performance of boys was superior to the girls in all the branches.
3. The best group performance of upper-middle class was found to be followed by middle class, upper class, lower-middle class and lower-lower class.

Collins and Lynn (1986). The purpose of this study was to assertion differences in ability, academic achievement, and aspiration of mathematically gifted males and females and to analyse factors that contribute to high levels of performance among these individuals. The 67 subjects in this study (60% males 40% females) were identified as mathematically gifted in their sixth grade at age 10 or 11. Significant differences in the number of advanced course were found in favour of males. The difference in the means (Mm = 8.73 and Mf = 7.15) indicates a higher change of acceleration for the males rather than a failure for the females to
pursue advanced elective courses the math and science. The male exhibited a significantly higher correlation between the SAP math and the number of courses in math and science than the females. When the variables of course taking was controlled, significant difference between the mean scores on SAT math did not occur. Influences emerging as positive factors in high achievement were; early identification of mathematical ability placement with peers of similar intellectual talent, opportunities to accelerate learning, knowledgeable and supportive teachers and parental encouragement.

**Friedman (1989).** This paper is a meta-analysis of studies that have taken place between 1974 and mid-1987 on sex differences in mathematical tasks. The methods used are estimations of (a) parameters for a random effects model and (b) coefficients for a linear regression equation, all based on effect sizes calculated from each study. These results were compared with meta-analyses or the studies on quantitative skill collected by Maccoby and Jacklin (1974). These comparisons, together with adhoc comparisons of Scholastic Aptitude Test effect sizes over the years, yield two conclusions. First, the average sex difference is very small: a confidence interval for it covers zero, though the interval lies mainly on the side of male advantage. Second sex differences in performance are decreasing over the years.

**Hyde, Fennema and Lamon, (1990)** conducted study to make a refined assessment of the magnitude of gender differences in mathematics performance. Homogeneity analyses were used to analyse the gender differences in math performance. Results indicate that there were no gender differences in problem solving in elementary or middle school, differences favoring men emerged in high school ($d=0.29$) and in college ($d=0.32$). Gender differences were smallest and actually favoured females in samples
of the general population, grew larger with increasing selective samples, and were largest for highly selected samples and samples of highly precocious persons. The magnitude of the gender difference has declined over the years, for studies published in 1973 or earlier d was 0.31, whereas it was 0.14 for studies published in 1974 or later.

**Kimball, (1989).** This article presents an examination of the little noted sex related difference in classroom grades. In both third and fifth grades, regression results showed that math and reading achievement test scores, together with student effort, were significant predictors of teacher rating of student mathematics achievement. Gender was not a significant contributor in either grade. Similar results were found when students were split by general and special education. The finding suggests that the teachers did not consider student gender when rating the mathematics skill level of their students.

**Cherian, et.al., (1993).** This study investigated gender and socioeconomic status differences in mathematics achievement of 1021 Xhosa children (369 boys and 652 girls) whose ages ranged from 13 to 17 years (15.6 yr.). They were chosen at random from the Standard 7 population of Transkei, South Africa. Their marks on the Standard 7 External Examination in mathematics were the criterion measure. A two-way analysis of variance indicated that mathematical achievement of girls was significantly higher than that of boys of low socioeconomic status whereas at middle and high socioeconomic status mathematics achievement of boys was significantly higher than that of the girls.

**Jain and Arora (1995).** The central focus of the study is to explore the achievement gap between boys and girls on mathematics and language and school level factors that are associated with this gap. A sample
of 1,746 schools, comprising 4,879 teachers and 23,700 students was covered in this study. Mathematics achievement test and the test of language were used in this study. The findings revealed that girls score approximately 12% and 11% standard deviation lower and than boys in mathematics and language respectively. The continuous stay of teachers of not more than five years in the same schools, proper qualification of teachers, appropriate number of teachers and higher percentage of female teachers are likely to improve the performance of girls and thus the primary education.

Kumar, (1995). The present study was conducted to study the attitude of male and female students towards mathematics on its utilitarian value dimension, social value dimension, intellectual value dimension, and the overall attitude towards the subjects. The sample of this study consists of 100 male and 100 female students of secondary school level of Bharatpur city. "Attitude towards mathematics inventory" developed by Lalit Kumar (1993) was used in the study. To test the hypotheses mean, standard deviation and t-value were calculated. Attitude of male and female towards math was expressed to the same extent on utilitarian value dimension of attitude towards math. Female group expressed more favourable attitude towards math than male groups on social value dimension of attitude towards math. Attitude of male and female students towards math was expressed to the same extent on aesthetic value dimension of attitude towards math. Attitude of male and female students towards math was expressed to the same extent on intellectual value dimension of attitude towards math. Attitude of males and females towards math was expressed to the same extent.

Melkonian, Michael. (1997). The sample was consisted of 400 students having 17+years age from 14 government general secondary
schools. The research analyzed the performance in Greek-Language grade and mathematics grade. It was found that generally female students attained significantly higher grades than their male counterparts.

**Barbara Signer, et.al., (1997)**. One hundred White and African American urban secondary students were interviewed for this study. After review and interpretation of the interview, tapes, responses to each question were coded, and three dependent variables were selected. Loglinear models, which analyze relationships among cross-classified variables, were used to investigate interactions among ethnicity, mathematics achievement level, socioeconomic status, and gender. Although, this study verified previous findings that male students are more likely than female students to enroll in additional mathematics courses and to attribute their mathematics grades to intrinsic constructs (ability and effort), interesting findings not previously explored are reported.

**Manning, M. Lee (1998)**. A review of literatures concerning the gender differences in mathematics and science achievement reveal certain stereotypes perpetuated by society, school and family. The 'Mathematics Report Card for the Nation and the States' by the National Assessment of Educational Progress and 'Everybody Counts: A Report to the Nation on the Future of Mathematics Education' report on the results of gender differences surveys conducted on male and female elementary students. Males were found to show higher motivation levels than females who were stereotyped as not having mathematical skills.

**Joseph and William (1998)**. In this study the effects of student's gender and cultural experience, (region) on the ratings of previously identified causal attribution factor, were investigated. The participants were 341 high school students from the urban (N = 144) and the rural (N = 197)
regions of Kenya. There were 205 male and 136 female students. Causal comparative research design was used and data collected using the Causal Attribution Scale (CAS). The Hierarchical linear model (HLM) technique was used to test the hypotheses. There were significant gender and cultural experience variations in the mean ratings of the attribution factors. Instructional Strategy was highly rated for perceived success, and lack of Ability for perceived failure. Effort was of least importance in making attribution to either perceived success or failure.

Alkhateeb (2001). This study explored gender differences in mathematics achievement of students in the last grade of high school and changes in these differences over a 10 year period in United Arab Emirates. A random sample of 2000 students, 1000 males and 1000 females for each of the 10 academic years, was taken from Ministry of Education records, and achievement results for males and females were compared. Findings indicated no significant overall differences. In the last 6 years, females scored higher, although effect sizes were small. Results are discussed in the light of cultural differences.

Nagaraju, Sumalatha, and Reddy, (2002). They made a study of academic achievement of senior secondary students in relation to certain factors. The sample was consisted of 240 senior secondary students of Tirupati and Chandragiri Mandals of Chittoor disst. in Andhra Pradesh. The students' marks in Junior intermediate class were considered as their academic achievement. The study indicated that the performance of girls was better than that of the boys in academic achievement and the performance of urban students was significantly higher than rural students in academic achievement.
**Orhun (2007).** This study aimed to investigate whether there is a relationship between gender and learning style, mathematical achievement and attitude towards mathematics. The subjects of this study were 5th semester students (42 females, 31 males) from the mathematics department at Anadolu University. The results of this study suggest that there were differences among learning modes preferred by female and male students, their mathematical achievements, and their attitudes towards mathematics. Mathematics achievement and attitude towards mathematics were not themselves dependent on gender.

**Mine and Erdinc (2008).** The Purpose of this study was to explore gender differences in mathematics achievement as demonstrated by performance on the mathematics subsection of a nationwide high school entrance examination in Turkey. In this study, the cities in Turkey were separated into five groups according to their level of economic development. The analysis was based on 2647 students that were randomly selected from these five different groups of cities. Although results indicated a statistically significant difference in mathematics achievement in favor of cities with the highest economic status, the effect size was quite small, which indicates the difference was not practically significant.

### 2.1.2 Attitude and math achievement

**Jha (1992)** investigated the relationship between attitude towards mathematics and achievement in mathematics of primary schools students. He found that - (i) There is a positive and significant correlation between proper attitude towards math and achievement in the subject (ii) High and positive correlation exists between attitude and achievement in case of high achievers and low achievers.
Walberg and Reynol (1992) conducted a study on structural model of high school mathematics outcomes. The model was further tested with a national probability sample of about 2,500 high school sophomore mathematics students. Corroborating previous findings, home environment and previous achievement had the largest effects on achievement, perhaps because they cumulate during the preschool and elementary school. Nonetheless, the other hypothesized factors—motivation, mathematics attitude, peer environment also had significant effect on mathematics achievement.

Rech and Stevens (1996). The mathematics achievement and attitude of black 4th and 8th grade students were the focus of a present study. The effects of gender, economic status, self-concept, and learning style on achievement were examined, along with differences between the grade levels on each variable. The sample consisted of 251 black students - 133 fourth graders and 118 eight graders. Results obtained from testing the 251 Black students in the sample indicated that they were from economically stressed families and generally possessed negative attitudes towards mathematics. Predictive equations were developed for the mathematics achievement of both fourth and eight grade black students. Among fourth graders mathematics attitude and economic status contributed significantly to the prediction of achievement.

Ma (1997) investigated the reciprocal relationship between attitude towards mathematics and achievement in math. Subjects were administered one student questionnaire and two mathematics achievement tests. Major findings from the model included

(a) A reciprocal relationship existed between every attitudinal measure and math achievement.
(b) The feeling of enjoyment, not the feeling of difficulty, directly affected math achievement.

(c) The feeling of difficulty functional via the feeling of enjoyment to effect math achievement.

(d) The perception of math as important was independent of other attitudinal measure.

Meheer (2004) conducted a study on the achievement at the secondary level and some of its determinants. He found that - (i) Achievement in mathematics was significantly related to major learning environment, attitude towards mathematics. (ii) Urban students show significantly higher achievement in mathematics, better learning environment and better attitude toward mathematics than their rural counterparts. (iii) No sex difference was found in account of students in math's regarding the enjoyment of learning environment of students and attitude of students towards mathematics. (iv) No stratawise and sex wise difference was found in the scientific attitude of students. (v) The high scoring group of students in major learning environment showed significantly higher score in math than their low scoring counter parts. (vi) The high scoring group of students in scientific attitude showed significantly higher achievement than their counter parts. (vii) The high scoring groups of students in SAT showed significantly higher achievement in math than their low scoring counterparts.

Saha, (2007) conducted a study of academic achievement in relation to cognitive style and attitude towards mathematics of primary school students. Results indicate that boys and girls differed significantly on attitude and math achievement. The component attitude in favourable
direction of learning mathematics is a significant contributor to the success in the mathematical achievements of both boys and girls.

2.1.3 Television and math achievement

*Keith, et. al.*, (1986). In the present study, the direct and indirect effects of TV time, homework, and parental involvement on high school seniors achievement were investigated by using the massive High School and beyond data set. As expected, homework had an important, positive effect on student achievement and TV time had a smaller, negative effect. Parental involvement had no direct effect on seniors achievement scores but did positively influence the amount of time that seniors spent on homework. Further analysis suggested the possibilities of low homework demands and of excessive weekday TV viewing. Given the time spent on TV and homework and their influence on achievement, we suggest that these variables be considered in the current push for educational improvement.

*Clarke and Costes* (1997). The relationship among school readiness, children's television viewing, parental employment, and the educational quality of the home environment were examined. Thirty five school children from low income families and their primary care givers were interviewed. Co-relational analyses indicated that television viewing time was negatively related to parental instruction and number of children's books in the home. Viewing time was also negatively related to children's school readiness skills.

*James Lendsay* (1999) studied the relationship between five after school activities and academic achievement. Generally more time in extra curricular activities and other structured groups and less time in jobs and television viewing were associated with higher test scores and class grades,
more time on home work was associated with better grades. The joint effects of all five after school activities nearly doubled the predictive ability of any single activity.

**Amita and Agarwal (2000).** The present study explores television viewing patterns of higher secondary level students and its impact upon their study habits. A purposive sample of 95 students stratified across sex and educational stream was selected. Tools used were self-made television viewing pattern inventory and palsane and Sharma's study habit inventory. Major results indicate that most of the students spent less than four hours per day in television viewing. Duration of televiewing was found to effect negatively the math achievement of students. Watching the television for more than four hours in a day adversely affect the math achievement. Variations in the patterns of televiewing influence the study habits of students.

**Rezel (2001) examined the relationship between amount of television viewing and educational achievement.** Small amounts of TV watching increased math achievement but as viewing increased beyond a certain point, achievement decreased.

**Wright, et al., (2001).** The relations of early television viewing to school readiness and vocabulary of children from low income families was the focus of this study. For both cohorts, frequent viewers of general-audience programs performed more poorly on subsequent tests than did infrequent viewers of such programs. Children's skills also predicted later viewing, supporting a bi-directional model. Children with good skills at age 5 selected more child audience informative programs and fewer cartoons in their early elementary years. Children with lower skills at age 3 shifted to viewing more general audience programs by ages 4 and 5. The results affirm
the conclusion that the relations of television viewed to early academic skills depend primarily on the content of the programs viewed.

**Ennemoser and Schneider (2007).** The longitudinal study explored the long term effects of television viewing on the development of children's reading competencies. They found that educational program viewing was positively correlated with reading achievement. Relations between entertainment program viewing and reading performance were generally negative. Children's who were classified as heavy viewers (average viewing time per day = 117 minutes) show lower progress in reading overtime as compared to medium and light viewer average viewing times per day 69 and 35 minutes, respectively. Partial support was found only for 1 of the 3 tested casual mechanisms, namely television induced reduction in leisure time book reading.

### 2.1.4 Sport and math achievement

**Lipscomb (2007)** investigated the relationship between secondary school extra curricular involvement and academic achievement. Independent of individual ability it is found that athletic participation is associated with a 2% increase in math and science test scores. Club participation is associated with a 1% increase in math test score. Finally, involvement in either type of activity is associated with a 5% increase in bachelor's degree attainment expectation.

**Gerber (1996)** found that school related extra-curricular activities (e.g. sports, band honor society) and outside school activities (e.g., hobby groups, scouting and 4-H) were related positively to mathematics achievement.
Holland and Andre (1987). In this study positive association between after school pursuits and achievement has been observed. Students involved in extracurricular activities such as sports also tend to have good attitudes, positive self-concept, and higher achievement than do student not involved in these activities.

Marsh (1992) had similar finding with small but statistically significant positive correlations between activities (e.g., sports, drama, chorus, clubs by subject meter, church student government, and service clubs) and achievement.

2.2 Relationship between math achievement and familial factors:

2.2.1 Parental education, occupation and family size of children and math achievement

Satyanandam, (1969) found that (1) The children of graduate parents performed better than matriculate parents. (2) The children belonging to upper and lower strata differ significantly in their academic achievement. (3) These were no great difference between middle and lower economic groups. (4) Sex had no bearing upon the achievement level.

Ojha, (1979). This study was conducted in all 1050 male students of class XI belonging to both rural and urban intermediate college of Jaunpur Distt. (U.P.). They filled the personal information, which was devised to collect information about the determinants of socio economic status. The marks obtained in the high school exam served as the criterion for achievement. The analysis of data revealed a significant positive correlation of 0.34 between achievement and socio-economic status for rural
boys and 0.69 for urban boys. The achievement of rural boys was found to be better than urban students. For both rural and urban students the t-test analysis led the investigator to conclude that the higher the SES better would be the academic achievement of students at high school level, parental education occupation and income were also related with educational achievement of both rural and urban boy of class XI.

Khanna, (1980). The sample comprised 1000 students of class VI, VII and VIII (among 30 schools of urban and rural areas). The academic achievement scores of half yearly and annual examination of students were used as the criteria of achievement. The Chi-square and contingency of correlation were used for analyzing the data. Major findings are - (1) Socio-economic status was positively and significantly related with academic achievement. (2) The correlation was more consistent in urban areas than rural areas. (3) The academic achievement of rural and urban students was closely related with their guardian’s income. (4) The academic achievement of children of various schools was significantly related with the socio-economic conditions of their family. (5) The academic achievement of children of educated parents, illiterate persons and educated mothers significantly correlated with the socio-economic status of the family.

White, (1982) studied the relationship between socio-economic status and academic achievement. Results indicated that as SES is typically defined (income, education, and occupation of household heads) and typically used (individuals as the unit of analysis), SES is only weakly correlated ($r = .22$) with academic achievement with aggregated units of analysis, typically obtained correlations between SES and academic achievement jump to .73. Finally characteristics, such as home atmosphere, sometimes incorrectly referred to as SES, are substantially correlated with
academic achievement when individuals are the unit of analysis \( r = .55 \). Factors such as grade level at which the measurement was taken, type of academic achievement measure, type of SES measure, and the year in which the data were collected are significantly correlated statically with the magnitude of the correlation between academic achievement and SES. Variables considered in the meta analysis accounted for 75% of the variance in observed correlation coefficient in the studies examined.

**Alwin and Thorton (1984).** This paper explores the potential role of socio-economic factors in school achievement outcomes at two separate periods in the life course early in childhood and during late adolescence. Our analytic results point to a potentially stronger role of early socioeconomic factors in cognitive development and school learning. In a single instance the case of family size - we find independent effects on school achievement from both early and late socioeconomic experiences.

**Krishnan and Namboodiri (1994).** The purpose of the present study is to find out the effect of familial variables on the educational status of the Adhivasis of Wyand. The major hypotheses of the study are stated as: the educational status of the Adhivasis of Wyand is dependent upon their family type, size and system. A stratified representative sample of 405 Adhivasis in Wyand District is included in the present study. A schedule structured by the investigators was used in the interview personally conducted by one of them. Chi-square test of hypothesis of independence was employed. Joint family facilitated educational status in a better way. Smaller family size has led to higher educational status. They may be due to the possible possession of optimum resources by small families.

**Shukla (1994)** conducted another study to find out the level of attainment of primary school in various states in India. For the entire country
the SC/ST pupils performed lower than the non-SC/ST ones. Further, the pupil's achievement was found to be positively related with father's education, facility for learning and educational environment at home. The variables related to schools and teachers indicated somewhat weak relationship with achievement.

Harolds (1996). Study includes measures of family norms in multivariate model of academic achievement applied to new nationally representative dataset the National Educational Longitudinal study of 1988. The study finds that when measures of family norms omitted from the models, student socio-economic status, all strongly influence academic achievement but when measures of family norms are introduced. The private school control is markedly reduced in achievement for mathematics and proves spurious for reading, history and science.

Ibrahim (1996) studied the relationship between the academic achievement of student in Jordan State Universities and the Socio-economic Status (SES) of their families. In this study statistically significant negative relationship were found between students GPA and their fathers and mothers income, occupation and education. However, the relationship between parents SES and students GPA were weak and without practical significance.

Crane (1996). Determinants of young children's mathematics skill home environment, socioeconomic status (SES) and maternal cognitive test scores were statistically analysed in a simple model. The effect of home environment on children's math test scores was large, even when SES and maternal test scores were controlled. The effects of SES and maternal test scores were smaller but by the means trivial.
Pong (1997). Result shows the schools that are predominated by students from single-parent families and stepfamilies negatively affect their students' achievement, even after individual demographic characteristics and family background are controlled. This negative effect of single-parent families and stepfamilies is partly explained by the relatively low socioeconomics status of children in these schools. However, the negative effect of single-parent families and stepfamilies on school achievement can be countervailed when social relations among parents are strong.

Caldas and Bankstone (1997). The relationship between the socioeconomic status (SES) of peers and individual academic achievement was examined in this study. Regression techniques were used to analyses the data. Peer family social status in particular does have a significant and substantive independent effect in individual academic achievement, only slightly less than an individual's own family social status.

Campbell and Beaudry (1998). The study includes 11th grade mathematics students (330 boys and 213 girls) by using Campbell's differential socialization paradigm as a theoretical framework. The path model for both the sexes showed that educated mothers had strong indirect effects on their children's mathematics achievement.

Senechal and Lefevere (2002). This article presents the findings of the final phase of a 5 year longitudinal study with 168 middle and upper middle class children in which the complex relations among early home literacy experience, subsequent receptive language and emergent literacy skills, and reading achievement were examined. Parent involvement in teaching children about reading and writing words was related to the development of early literary skills. Early literacy skills directly predicted
word reading at the end of grade 1 and indirectly predicted reading in grade 3. Word reading at the end of grade 1 predicted reading comprehension in grade 3. Thus the various pathways that lead to fluent reading have their roots in different aspects of children early experiences.

Wilkins and Ma (2002). Authors found that parent education had a positive relationship with students initial status in all three content areas however, influence from peers and parents had a consistent relationship to growth in middle school for all three content areas. In high school, parent push was related to student growth only to algebra and geometry peer influence on growth was not evident in high school.

Ercikan, et.al., (2005). This paper reports an exploratory study examining factors that might be associated with achievement in mathematics and participation in advanced mathematics courses in Canada, Norway, and the United States of America (USA). These factors, which were not directly related to schooling accounted for large degrees of variability, 24% to 39%, in mathematics achievement scores. Confidence in mathematics was the strongest predictor of achievement for students from Canada and Norway, whereas for the students from the USA, parents' highest education level was the highest predictor of achievement. Student home environment related variables were stranger predictors of.

Byrnes and Miller (2007). In the present study, the authors propose a new framework that integrates literature on achievement, supports the testing of novel hypotheses, and stresses the importance of examining a large number of factors in the same study. This framework assumes that high achievement is a function of three categories of factors: (a) opportunity factors (e.g. coursework). (b) propensity factors, (e.g., prerequisite skills, motivation), and (c) distal factors (e.g., SES). A secondary analysis of the
National Longitudinal Educational Study (NELS:88) using hierarchical regression and structural equation modeling revealed that 58-81% of the variance in achievement was explained by family variables and specific opportunity and propensity factors.

2.2.2 Parental assistance in mathematical problem solving and math achievement

Fields and Herring (1975). This study was directed towards identifying parents and teachers who demonstrated interest in the achievement of their child and students and then evaluating whether their interest had a relationship to the student's achievement. Samples were 240 ninth grade algebra students in four Junior high Schools in an urban school system. The statistical analysis yielded the following major conclusions (1) students whose parents were more interested in their children's algebra achievement were more likely to achieve better in algebra than students whose parents were less interested. (2) Students whose teacher's were more interested in their students' achievement were not likely to achieve better in algebra than students whose teachers were less interested. (3) Student who had more interested teachers and less interest parents were not likely to achieve as well as in algebra as students with more parents. Parents interest was thus determined to be posterity related to students achievement.

Wilson and Hunter (1976). The major objective of the study was to determine if there exists significant relationship between parental involvement and academic achievement. It was found that differences in parental involvement are related in high or low achievement among children. Analysis of data shows a relationship between parental involvement and student achievement.
Green and Walker (1987). The result shows that stepwise multiple regression analyses revealed various combinations of the predictors accounted for significant portions of the variance in all parent involvement outcomes. Parent conferences (52%), parent volunteers (27%), parent home tutoring (24%), parent involvement in home instruction programs (22%), and teacher perception of parent support (41%). Variables most consistently involved in outcomes were teacher efficacy and school socioeconomic status.

Trusty (1998). The author examined the influence of family and parenting variables on expectations regarding education. Zero order correlation coefficient, New computer analysis program and Chisquare Automatic Interactions Detector (CHAID); magidson, 1993) were applied to analyses the data. Socio economic status (SES) was most strongly related to educational expectations. Adolescents perceptions of parents personal involvement and parents reports of this own behaviour were both related to educational expectations.

Agarwal and Kapoor, (1998). They made a study of parent's participation in children academic activities in relation to their academic achievement at the primary level. Main finding of the study indicated that the parent's participation in children's academic activities also play an important role in enhancing their academic achievement.

Sarita and Mayuri, (2003). They conducted a study to see the influence of family and school factors on the academic achievement of residential school children. The sample consisted of 120 children 60 from IX and 60 from X and 40 teachers from IS residential schools of Hyderabad city. An interview schedule was developed by the investigator to study the family conditions and the questionnaire was developed by investigator to
study school factors. I-IV ranks holding children were the criteria of sample selection from the previous final year examinations.

1. The results indicated that girls were superior to boys.
2. Family factors like parental aspiration and SES significantly contributed to academic achievement.

**Anderson, et.al. (2006).** This study explored the relationship between student achievement and student, school and variables from the pan-canadian assessment program administered by the council of Ministry Education Canada (CMEC): the school achievement Indicators Program (SAIP) Mathematics study also evaluated the datasets used in relationship to their utility to mathematics achieve both age groups and for both domains of mathematics. As students make use of instructional supply (parental assistance with mathematics homework, computers in the mathematics classroom) there is an associated decrease in mathematics scores.

### 2.3 Relationship between math achievement and institutional factors:

#### 2.3.1 School type and math achievement

**Kulkarni and others (1970).** conducted the first major study on achievement survey in mathematics covering the three levels of education, viz, end of primary (Class V), end middle (Class VIII) and end of secondary stage (class X) in 15 states. The number of students in the sample varied from more than 28,000 at primary level to nearly 20,000 at the secondary level. The major findings of the study for the primary level were. Boys achieved higher than girls, the socio economic conditions of the parents of school type (e.g. govt. or private management) provided better teaching
learning situations, and no relation was found between school achievement and teacher qualifications.

Coleman, Hoffer and Kollgore (1982). Three types of analysis are carried out in this study and provide strong evidence that there is, in vocabulary and mathematics, higher achievement for comparable students in catholic and other - private schools than in public, the results are less consistent increasing.

Noell (1982). In this study he reanalyzed the impact of catholic school attendance on the reading and mathematics achievement of senior and sophomore pupils. The standardized tests in reading and mathematics were used to measure the achievement in both subjects. Findings - except for a statically significance but small advantage on sophomore reading tests, catholic school pupils were found to do no better or worse than public school pupils.

Reeta (1986) conducted a study to compare private and government schools on matriculation result of 1985. A correlation statistics was also worked out to find out the mean scores on mathematics and sciences (in both private and government settings). The results show that the pass percentage government students were 45.8 as compared to the 87.5 percent of the boys belonging to private institutions.

1. The pass percentage of government girls was 44.8 and that of 81.8 in case of private girls.
2. The highest marks percentage was 81 in case of private schools and only 76 in case of government school.
3. The private institution got 7 positions with an average of 80 percent marks as compared to position from government schools with an average of 78 percent marks.

4. The number of first divisioners from private sector was more than govt. sector. It was 263 in private schools and only 48 in govt. schools.

5. The number of students failed in math and science was more in case of govt. schools than private schools.

On the whole of was found that: The boys have done significantly better than girls (the level of significance .01)

1. Private schools boys have performed significantly better than government school boys (the level of significance .01)

2. Similarly private school girls have done significantly better than government school girls.

Murthy and Kulshreshtha (1991) tried to study whether academic anxiety facilitates or impedes academic achievement in two management system viz. private and public school. A sample of 199 class IX students comprising boys and girls (100 boys and 99 girls) were taken form Government and public school of South Delhi. The academic anxiety scale of Sinha was used as a tool to collect the data. The collected data were analysed statistically using mean, standard deviation, correlation coefficient, one way ANOVA and for post hoc comparison, Duncan's Multiple range Tests. Major findings of the study are as under: Academic anxiety and academic achievement are inversely and significantly related. It means, as the academic anxiety increases, the achievement level decreases.
1. That the mean difference of boys and girls of government and private schools differed significantly on their academic achievement. The private boys have achieved far better followed by private girls. Govt. boys and govt. girls while as, on the whole boys and girls do not differ significantly in academic achievement.

2. It has been found that government and private school students differ significantly (level of significance .01) in academic achievement and this difference is in favour of private school students.

White (1992) conducted a study to examine the effect of type of schools on achievement in vocabulary and mathematics. The Major results of the study are as under: Once public and private schools are statistically equated they appear be produce similar gain in achievement. (i) On average catholic school students, slightly scored higher in vocabulary and mathematics test then public school students. (ii) Student background characteristics like SES largely influence the educational gains. (iii) That the difference in achievement in public and private school are trivial in size and highly uncertain.

Sajitha (1994) investigated as whether the greater managerial discretion associated with the private sector leads to high academic performance in Tamil Nadu. A multi grade sampling design was used, yielding on analytic sample of 2667 pupils in 113 schools (65 public school, 20 private aided schools and 20 unaided private schools.) located in five districts of state. Major findings of the study are - (i) Neither the father's education nor mother's education seems to affect student performance. (ii) Aided schools exert a strongly positive effect on mathematics achievement
but the effects for reading comprehension are mixed. (iii) The class-teacher ratio has a positive effect on mathematics achievement. (iv) Pupils in school with better physical facilities score higher. (v) Private unaided schools performed worse than public school. (vi) Other important results included the fact that longer teacher experience seems to produce a negative effect.

Geeta (1994). In her study found that in Uttar Pradesh, private unaided junior school were significantly more cost-effective than either government or private aided junior schools. Surveying grade 8th students in 30 Secondary Schools in Lucknow in 1991 and controlling for student background characteristics and selection effects, it was found that students in private unaided junior schools performed significantly better on tests of reading and mathematics then students in government and private aided schools.

Rath and Saxena (1995). The study focuses on the difference between SC/ST and non-SC/ST students on mathematics and language achievement and identifies the pupil and school level factors attributable to those differences. The sample comprised 5, 292 SC/ST and 17,771 non-SC/ST students of IV and V grade. To estimate achievement of students on language and mathematics standardized achievement tests (Shukla, et al 1994) were used. Hierarchical linear regression model and meta analysis were used for the analysis of data. The results reveal that SC/ST students score lower than non-SC/ST students in both the subjects. Father's education contributes for better achievement of SC/ST students. In mathematics, the achievement gap does not vary significantly across the schools whereas in language, it varies in Karnataka and Kerala. Test and feedback provided by the teacher tends to reduce the gap between SC/ST and non-SC/ST students in language.
Estalle, et.al. (1997) investigated the impact of public versus private finance of education and public versus private management of school on school cost and efficiency, using school level data on revenues, expenditure, enrollments, examination scores and student characteristics from Indonesian Primary Schools. The data for analysis was taken form National Survey of Public and Private Schools in Indonesia conducted by the Ministry of Education and Culture (MOEC) 1992. The survey collected data on a wide range of school level variables including number and salaries of teachers, conditions and availability of classrooms and libraries, level and source of funding, type of expenditure and average score on sixth grade national examination in Mathematics and Bahasa Indonesia. The major findings are: (i) Private management is more efficient than public management in achieving academic quality. (ii) Private funding also improves efficiency whether schools are publicly or privately managed, and (iii) Private managed school behave differently from public managed school because they have different objective functions, greater autonomy and have to face greater pressure from market place to operate efficiently.

Singh Satvir (1996) studied the determinants of learner achievement in mathematics and language at primary stage using the data of Karnataka State Baseline Assessment Study covering 177 schools, 442 teachers and 2568 pupils. Major Findings of the study include the following: There were large and significant differences between schools in their math mean performance. (i) Govt. Schools performed lower than privately managed schools. (ii) On average boys were performing better than girls. (iii) There was a positive association between mean SES (Intake composition) and school mean performance.
Mc Ewan and Patrick (2001) presents the results of a study comparing Spanish and mathematics scores of children of 8 grades in types of public and private schools. Controlling for students and peer attributes, the initial results suggest that the average students scored higher on Spanish and mathematics test in private Non-Voucher schools than in other types of schools.

Aswal (2001). He conducted a survey on the achievement in mathematic across different level of socio-economic status (SES). 200 students were randomly selected from 5 college of Tehri district SES Scale by Pareek and Trivedi, Pearson product-moment correlation and Critical Ratio were applied to analyze the data. The important objectives were to study the relationship between SES and academic achievement. Result showed the significant relationship between them as three colleges reflected significant difference among different levels of SES out of 5 colleges.

Young et al, (2006) explored the relative importance of school and individual factors in the determination of science learning. Hierarchical linear analyses showed that individual measures accounted for most of the variance. Previous achievement was the preponderant influence on subsequent achievement. Nonetheless, initial science attitude, instructional time home environment and exposure to mass media were also significant individual level influence on science achievement.

2.3.2 School Resources and math achievement

Das (1974). Conducted a study to ascertain weather there was any impact of the physical conditions (facilities) of primary schools on the retentively and regular educational program of its children. The study
revealed that there was significant relationship between efficiency in education and physical facilities in schools. The school conditions definitely seemed to have a favorable impact on school education. Better physical facilities increased the attractive and retentive power of the school as well as provided situations conducive for effective education and hence contributed to towards better education of children in the school.

**Sutton and Soderstrom (1990).** Relationships between school and social factors reported on the Illinois school report card were examined, along with student achievement, as measured by the Illinois goal assessment program (IGAP). The participants in this study included all of the 3,856 schools in Illinois that reported information for the 1994 Illinois school report card. Statistical analyses included the generation of frequency distribution and descriptive statistics for all variables. Correlational analyses included bivariate correlation multiple linear regression and stepwise multiple regression. Results revealed that all of the independent variables (except high school per-pupil expenditure) were significantly related to achievement scores. A school's IGAP achievement score is more a function of the school demographic status and SES than its effectiveness education legislators, and the public should consider this when comparing achievement among and rank them accordingly.

**Caldas (1993).** This study examined the direct effects on, and contribution of, several input and process factors on public school achievement in Louisiana. Descriptive statistics were used to analyse the data. Socioeconomic status and minority status were the strongest predictors of school achievement in every model. The discrepancy between the achievement of white students and black students increased with grade level of school. School size did not have any meaningful effect on school
achievement, nor was the effect of class size significant for every sub-

population. However, students attendance had a more substantial (P<0.001) effect in every model on school achievement.

**Varghese (1994)** conducted a study under DPEP programme on learner achievement in mathematics and school quality. He found that - (1) Schools managed by private sector show marginally better performance than government schools. (2) Parental education and occupation are also important factors associated with learner achievement. (3) There exist no direct association between school facilities and performance of children in grade IV test. (4) Boys have very marginal advantage in mathematics and girls in Malayalam. (5) Sex of learner does not seem to be important in predicting learner achievement. (6) The level of school infra structure and variation in the availability of teaching material seem not be closely related with levels of learning.

**Singh and Saxena (1995).** This paper attempts to study the effects of school variables on pupil's achievement using the data of Baseline Assessment Studies (BAS) recently conducted in the eight states of India. Students of Class IV and V were administered tests on mathematics and reading. It is found that there exist gender gaps in achievement. Mother's and father's education and father's occupation are positively associated with the pupil's math achievement. The schools level factors of academic climate (test and feed back, homework, etc) and teacher quality (teacher study) teaching experience, etc. are the prominent contributors as compared to those of school resources (educational and physical facilities).

**Gupta and Gupta (1995).** This paper attempts to study effects of operation Black board (OB) and incentive schemes on pupil’s achievement in mathematics and language. The data collected from 1,746 schools for base
line assessment studies of DPEP formed the basis of this study. Detailed information about school and pupil characteristics were collected through school and pupil schedules respectively. To estimate achievement of pupils on mathematics and language, standardized achievement tests (Shukla, et al. 1994) were used. Hierarchical linear model and meta analysis are used to analyse the data. Supply of free text books and mid-day meals have indicated positive and significant impact on pupil's achievement in Madhya Pradesh whereas scholarship for regular attendance as shown significant impact on language achievement in Kerala.

Singh and Sexena (1995) attempted to study the effects of school related variables on pupil achievement using the Baseline Assessment Studies (BAS) data in eight states. Main Results: The results show that there are large and statistically significant differences between boys and girls within school in their achievement in mathematics in states of Assam, Haryana, Karnataka, Madhya Pradesh and Orissa. These differences are also found statistically significant in language achievement for all states except Haryana and Kerala.

i) At the school level the mean SES is positively associated with the achievement in mathematics and language after adjusting for pupil's background.

ii) Mother and Father's education and father's occupation have positive association with pupil achievement and are mostly consistent across states.

iii) The factors of educational and physical facilities in school have positive association with school mean achievement in mathematics.
Okpala et.al (2001). He conducted a study to see the influence of parental involvements, SES of parents and instructional supplies expenditure on mathematics achievement scores of 4,256 of 4\textsuperscript{th} grade students in North Carolina. An educational production function framework was used to see the influence of educational resources on the mathematic achievement score.

Results showed that percentage (\%) of students in free/reduced price lunch programme was related negatively to the students’ academic performance in mathematics. This supports the notion that economic circumstances are correlated with academic achievement.

Gupta (2003) conducted an experimental study to see the impact of physical facilities of primary schools on scholastic achievement of the students. He has taken primary schools of two districts i.e. Calcutta and Cooch Bihar. Two random samples of schools were estimated. The three subjects (1) Bengali language (ii) Arithmetic and (iii) Environmental studies are taught in primary. Three achievement tests for three subjects were constructed and used to assess the academic achievement of the children at the end of the course. The results of the test indicate that differences between means of two districts in all three subjects are significant at .001 level as (ii) students of primary schools of Calcutta has significant higher mean achievement score in Arithmetic than the primary school students of Cooch Bihar. (iii) The primary school of Calcutta has good physical facilities than the primary school of Cooch Bihar.

2.3.3 Class size and math achievement

Joshua, et.al. (1999). The twelfth century rabbinic scholar Maimonides proposed a maximum class size of 40. This same maximum induces a nonlinear und nonmonotonic relationship between grade
Review of Related Literature

enrollment and class size in Israeli public schools today. Maimonides rule of 40 is used here to construct instrumental variables estimates of effects of class size on test scores. The resulting identification strategy can be viewed as an application of Donald Campbell's regression-discontinuity design to the class-size question. The estimates show that reducing class size induces a significant and substantial increase in test scores for fourth and fifth graders, although not for third graders.

Lee and Smith (1997). The study described in this article investigates the relationship between high school size and students learning. They used three waves of data from NELS:88 and hierarchical linear modeling (HLM) methods to examine how students achievement growth in two subjects (reading and mathematics) over the high school years is influenced by the size of the high school they attend. Three research questions guided the study: (a) which size high school is most effective for students' learning? (b) In which size high school is learning most equitably distributed?, and (c) Are size effects consistent across high school defined by their social compositions? Results suggest that the ideal high school, defined in terms of effectiveness; (i.e., learning), enrolls between 600 and 900 students. In schools smaller than this student learn less; those in large high schools (especially over 2,100) learn considerably less. Learning is more equitable in very small schools, with equity defined by the relationship between learning and student socioeconomic status (SES).

Monk (1987). If economies of scale are important in secondary education in ought to be possible to observe fewer problems with input indivisibility and greater degrees of resource specialization in larger compared to smaller secondary schools. Moreover, it ought to be possible to observe some evidence of greater curriculum comprehensiveness in larger
schools since this is one of the possible consequences of scale economies. The present study examines these phenomena using data collected in New York State schools. Results indicate that the sources of scale economies are largely exhausted by the time enrollments reach relatively small levels and that beyond these modest enrollment levels, gains in curricular comprehensiveness are trivial.

Lee and Smith, (1995). This study assessed the impact on 10th-grade students of attending high schools whose practices are consistent with the school-restructuring movement. Using data on a sample of 11,794 sophomores in 830 high schools from the first two waves of the National Educational Longitudinal Study of 1988, the authors evaluated restructuring effects on students' gains in engagement and achievement in four subjects and the social distribution of those gains. High schools with several practices consistent with restructuring and those with none of the 30 practices that were considered were contrasted with schools that engaged in only traditional reforms. School size was evaluated as an independent structural feature. The results revealed that students' gains in achievement and engagement were significantly higher in schools with restructuring practices and lower in schools without reforms. Higher and more socially equitable engagement and achievement were consistently associated with smaller high schools.

Brown and Jencks (1975). The authors find few, relationship between high-school characteristics and any measure of high-school effectiveness. From these findings, they argue that, at least for whites, changes in high-school characteristics like teacher experience, class size, and social composition are unlikely to change high-school effectiveness, and that
holding schools accountable for one outcome is unlikely to guarantee effectiveness on another.

Krueger (1999). This paper analyzes data on 11,600 students and their teachers who were randomly assigned to different size classes from kindergarten through third grade. Statistical methods are used to adjust for nonrandom attrition and transitions between classes. The main conclusions are (1) on average, performance on standardized tests increases by four percentile points the first year students attend small classes; (2) the test score advantage of students in small classes expands by about one percentile point per year in subsequent year; (3) teacher aides and measured teacher characteristics have little effect; (4) class size has a larger effect for minority students and those on free lunch; (5) Hawthorne effects were unlikely.

2.4 Review of the Studies:

A critical analysis of the above mentioned studies give rise to certain substantive inquiries which need to be highlighted and addressed to for the sake of further investigation. Most of the studies whether conducted in India or abroad support multiple results leading to phenomena where the need of further research becomes imperative. In the area of school resources it has come to light that research studies found contrary and mixed results. The studies conducted by Sajitha (1994), Das (1974), came to the conclusion that school resources (school infrastructure, condition and facilities) largely enhance academic achievement. As against this, studies conducted by Varghese (1994), Hanushek (1989) and hold that school resources are not related to academic achievement. Nearly, all the studies reported above except that of Ibrahim (1994) revealed that socio-economic status is the significant determinant of academic achievement. Similarly, except Sajitha
(1994) and White (1992), all the investigators referred in the literature have found that in the school quality and academic achievement private schools are performing significantly better than government schools and government aided private schools.

The contradictory findings of various studies mentioned above inspired the investigator to conduct a study of influence personal, familial and institutional factors on achievement of secondary school students in mathematics. There is already lack of research activity in the area of secondary education in the country. Although, a lot of research has been conducted outside the country on these variables, still all these variables in combination have not been studied extensively.

Besides getting an over all view of research at secondary stage of education, the review of literature helped the investigator in understanding the important variable like gender attitude, T.V., sport, parental education, occupation, family size and assistance in math problem, school resources, school types, and class size. They helped in understanding the relationship between achievement and other variables like students’ motivations, students’ engagement in extra curricular activities, family characteristics, school quality, school expenditure SES, teacher pupil ratio etc.

The review of studies highlighted the need for such a study in the light of inconclusive and conflicting findings. It also come to the notice of the researcher that the work so far done is this area in India is inadequate and the area needs further exploration especially at secondary stage of education. The review through some light on method of data collection, research design, method of tool construction, standardization and use of statistical tool for analyzing data, which helped the researcher in developing an
appropriate methodology for the present investigation which will be discussed in the next chapter.