CHAPTER - II

REVIEW OF RELATED LITERATURE

A Literature review is a body of text that aims to review the critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic. Literature reviews are secondary sources, and as such, do not report any new or original experimental work.

Research in education, as in other fields, is an endeavor to reach out for knowledge. It is not a search that yields infallible truths, but it is a search that provides knowledge for the solution of problem in the field of education. Research takes the advantage of the knowledge, which has accumulated in the past as a result of constant human endeavor. Research can never be undertaken in isolation of the work that has already been done on the problems that are directly or indirectly related to the study proposed by the researcher. Therefore, careful reviews of the research journals, books, dissertations, thesis and other sources of information on the problem are very essential for any research.\(^7\)

This review of the research literature on difficulties with problem solving in mathematics shows us that problem solving in mathematics is a complex process which requires an individual who is engaged in a mathematical task to coordinate and manage domain-specific and domain-general pieces of knowledge. It also suggests that (i) the mathematics content level of the problems which students at different year levels of schooling will be able to solve successfully and (ii) the different strategies or heuristics which students at different year levels use to solve the same mathematical problems must govern the design of problem-solving curricula at the various year levels of schooling.

A review of related literature is an important prerequisite to actual planning as well as the execution of any research work. In recent years, research interests have been directed to find out the relationship between sex difference and achievement in subjects like science, arts, mathematics etc. The studies vary in methods, sample tools and techniques. Several studies too have been conducted in India in the recent years on these areas. A good deal of research has gone into the methods, strategies

\(^7\)Dr.M Vinaja, Inquiry Training Model. New Delhi: Discovery Publishing House, 1999, p
of teaching mathematics. These include studies, attitudes, mental ability, creativity, knowledge and understanding, study habits, self concept etc. given below is a sincere attempt by the researcher to survey the studies conducted abroad as well as in India.

Terman and Tyler’s (1954) review of research also corroborate the sex difference in achievement. Studies conducted on sex difference using standardized achievement test, showed that girls typically excel in such school subjects such as English, Spelling, Writing and Arts while boys excel in Arithmetical reasoning, History, Geography and Science.\(^8\)

Flanagan and Davis (1964) found that boys were generally superior to girls in mathematics and science by the time they reach high school. This was further supported by the fact that 73% male national merit scholars opt for science careers as against only 36% of female national merit scholars.\(^9\)

Sharma (1975) investigate the variations in the achievements of adolescent eleventh grade urban students in the four Indian states of Haryana, Punjab, Himachal Pradesh and Chandigarh. The study proves that boys achieve higher grades in school achievement test than girls. The possible explanation given by the researcher for this was the differential treatment to boys over girls in Indian culture.\(^10\)

Sharma (1975) in his analysis of textbooks, prescribed for delta class in Rajasthan stated that the syllabus in mathematics was highly defective, outmoded and wanting in a proper procofevaluation. He also pointed out that there was no relation between the course–content prescribed in the syllabus and that presented in the textbooks.\(^11\)

Krutetskii (1976) found that a major difference between good and poor problem solvers lay in their perception of the important elements of the problems they were attempting to solve. Good problem solvers typically lad certain abilities that poorer problem solvers lacked: (i) the ability to distinguish relevant from


irrelevant information (ii) the ability to see quickly and accurately the mathematical structure of a problem, (iii) the ability to generalize across a wide range of similar problems, and (iv) the ability to remember a problem's formal structure for a long time.

L.K. Sinha (1977) conducted a study of the difficulties in learning Mathematics experienced by pupils of class VIII in Kohima high school going children in Kohima area of Nagaland have difficulties in learning mathematics due to intellectual inadequacies, emotional problems, home environment, teacher behavior and classroom activities and textbooks. Boys and girls coming from rural areas have more difficulties in learning mathematics than their counterparts in the urban areas. Children of parents with higher educational and occupational status have less number of difficulties than those with lower educational and occupational status.12

Koul’s (1978) study found that high and low achievers in mathematics differed significantly on eight of Murray’s needs. The low achievers in mathematics were exhibitory, succorant, heterosexual and aggressive. High intelligence, numerical ability, abstract reasoning and adjustment were some of the characteristics of mathematically gifted children.13

T.R. Balieh (1979) conducted a study of the causes of failure in mathematics among the tribal pupils of class VII in West Khasi Hills District, Meghalaya. He found that the major causes of failure in mathematics among the tribal pupils are due to the poor study habit, unfavourable attitude and emotional problems of the pupils, lack of interest on the part of the pupils to study the subjects, lack of taste and lack of motivation, mental retardation and backwardness in the other subjects. Family difficulties, low economic status, lack of training of the mathematics teacher, poor school administration etc. are also the major problems.14

Ngunthanluangi (1980) conducted a study of achievement motive in science and mathematics among class X students in certain selected high schools in Manipur. He noted that the grade of achievement in science and mathematics is not equal in respect of boys and girls for government category of school and the girls are found to be more interested in mathematics in comparison with science. However, only one is found to be in the first category and that is for the achievement of boys. It is for the interest of the students and as well as for the teacher.15

Ayanla Imchen (1982) she conducted a study of academic achievement of high school pupils in Nagaland coming from English and Vernacular media school. The data she collected were analysed in relation to 130 pupils coming from English medium school and 193 pupils coming from vernacular medium school. The achievement score of the pupils in class VI and class IX were expressed separately in average percentage. Variably such as sex, socio-economic status and locality of the pupil have been taken into in the analysed. The mean and standard duration of the two groups were calculated, ‘t’ test were computed to find out the significance of different means.16

Lester (1982) postulated that successful problem solving in mathematics is a function of at least five components: (i) mathematical knowledge and experience, (ii) Skill in the use of a variety of generic "tool" skills (e.g., sorting relevant from irrelevant information, drawing diagrams, etc.). (iii) mathematical problem solving, (iv) knowledge about (one's own cognitions before, during, and after a problem solving episode, and) (v) the ability to maintain executive control (i.e. to monitor and regulate) of the procedures being employed during problem solving.

Rajendra Ram (1983) has conducted construction and standardisation of an achievement test in secondary school mathematics. The first important step while planning a test or any evaluation tool is the identification of instructional objectives. The investigator seeks to study sex difference and age difference on each of the four learning outcomes namely knowledge, understanding, application and skills as well as the total learning outcomes in mathematics. To examine the sex difference in

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15Ngunthantluangi, A Study of Achievement Motive in Science and Mathematics Among Class X Students in Certain Selected High Schools in Manipur. Ph.D. diss., NEHU, Nagaland Campus, Kohima - 1980
mathematics have not yield consistent finding sometimes statistical significant difference in favour of male students and sometimes they favour female students.\textsuperscript{17}

Bhat (1984) studied the existing syllabus of mathematics with a view to seeing its relevance to the jobs of technicians and discovered that solving simple trigonometric equations was not relevant to the core curriculum were identified.\textsuperscript{18}

S. L. Jain and G. L. Burad (1988) have found the following causes as responsible for low results in secondary mathematics in Rajasthan: non-availability of mathematics teachers due to late appointments and frequent teacher transfer; lack of appropriate classroom, blackboards and other physical facilities; irregular attendance of students; low standard in the lower classes; non-availability of Textbooks; lack of timely correction of homework; overburdened and uninteresting curriculum; lack of child-centred teaching; insufficient periods for teaching mathematics and lack of suitable teaching aids. They have, however, not analysed why these causes affect mathematics more than other subjects.\textsuperscript{19}

Singh (1988) studied the influence of residential place on the achievement of students with the objective to study the effect of location on the achievement level of students by taking a sample of 650 adolescents within the age range of 17 to 20 years and found that the urban students had better academic achievement than rural students, the reason behind this may be the facilities and exposure provided to urban learner.

Third, S.K (1990) has found, rather unexpectedly that rather socio-personal factors such as education of father and occupation of father or mother have no significant effect on the problem solving ability in mathematics of school children. However the education of the mother was found to have a significant effect on the problem solving ability of the children of classes VII-IX. Independent study, Punjab Agricultural University.

\textsuperscript{17} Rajendra Ram, Construction and Standardisation of an Achievement test in Secondary School Mathematics. Ph.D. diss., NEHU, Mizoram Camppus, Aizwal-1983
Krishnan.N.J (1990) has found that there is no significant relationship between identification of problem solving strategies (IPSS) and either application of problem solving strategies (APSS) or achievement of problem solving in mathematics (APSM), though the last two are significantly correlated. The essential problem in school mathematics is how to teach problem solving strategies to students so that they may become efficient problem solvers, M.Phil in education, Allagappa University.

Caroline Ngailiankim (1991) was conducted a study of selected variables associated with achievement in mathematics. There is a significance association between attitude towards mathematics and achievement in mathematics association can be considered as close as the value of C was to be equal to 0.24. The study showed that achievement in mathematics is significantly associated with the variables at attitude towards mathematics, educational aspiration. Numerical ability abstract reasoning and the personality characteristics less-intelligent more-intelligent and this regard rules conscientious.20

C. Dandapani (1992) has developed a discriminate function depending linearly on eleven variables representing problem-solving, skill, review, reinforcement, assignment, organisation of subject-matter, warmth of the teacher, planning, preparation, concept teaching and the valuation, to distinguish between effective and non-effective mathematics teacher. Effective and non-effective teachers differ in all the eleven aspects. The teachers’ perception of mathematics is found to vary significantly with their years of experience but does not vary with their qualifications, the types of school or the place of work or teaching load. Female teachers are found to have significantly higher perception than male teachers. Two major dimensions are identified as problem-solving and reinforcement.

Rangappa (1992) studied self concept and reading ability in relation to achievement in mathematics of 7th class students with the objective to identify whether boys and girls, rural and urban students differ in their achievement by taking a sample of 1000 students with mean age of 12.5 years and found that the students studying in urban school performed better in mathematics than the students studying

in rural school; self concept, location, gender and reading ability affected the achievement of students in Mathematics.

Meghali Baruah (1993) conducted a study of the relationship between attitude towards and achievement in mathematics of standard IX high school students in Dibrugarh town. She found in her study that the attitude of the standard IX students studying in the high schools of Dibrugarh town towards mathematics is favourable. The obtained frequency distribution of the attitude scores of the entire sample is positively skewed and leptokurtic. The attitude of boys is positively skewed and leptokurtic but that of girls is negatively skewed and leptokurtic in nature. The significance difference of boys is higher than that of girls in their mean attitude scores towards mathematics.\(^{21}\)

Foong (1990, 1994) in her studies of pre-service teachers who were training to be mathematics teachers found that:

(i) Successful problem solvers translated the problem statement more correctly and more exactly than did unsuccessful problem solvers. (ii) Unsuccessful problem solvers tended to attend to obvious details, translating statement by statement without having a global representation of the problem situation. (iii) Successful problem solvers planned their solutions in more detail before carrying them out than unsuccessful solvers, who tended to be impulsive in executing a solution without a complete understanding of the problem. (iv) Unsuccessful problem solvers tended towards impulsive solutions and when in difficulty they often returned to the same incorrect method, sometimes repeat. (v) Successful problem solvers used more Meta cognitive processes which were task direct showing greater awareness of how things were in the solution path and where they should be going in the process. (vi) Negative emotional expressions such as frustration and confusion were found to be more frequent amongst the unsuccessful problem solvers.

Verma (1995) studied academic achievement of girls students in relation to their rural, urban background and found that IX grade rural students scored higher than urban students though they had lower level of aspiration and low intelligence quotient. Ecological deprivation was negatively related to achievement.

Mishra (1997) examined the correlates of academic achievement of high school students and found that intelligence was significantly correlated with academic achievement for both boys and girls; the correlation between intelligence and academic achievement was higher in case of girls; socio economic status was not significantly related with academic achievement of boys and girls; academic achievement of rural students was lower than the achievement of urban students; academic performance of girls was superior to the performance of boys.

Chen (2001) found different factor structures on mathematics achievement and supported the effectiveness of home environment, attitudes towards mathematics and educational aspiration as the more important and consistent predictor of mathematics achievement; peer influence, school environment and study habits had mixed inconsistent effects on mathematics achievement.

Gakhar et al. (2003) studied creativity, problem solving and personality in relation to scholastic achievement with the objective to study the relationship between academic achievement and problem solving by taking a sample of 545 students of senior secondary school and found that problem solving ability was significant and positively correlated with mathematical achievement.

Prakash (2003) studied temperament and memory as determinants of Mathematics achievement of intermediate students with the objective to study the relationship of temperamental variable with Mathematics achievement of boys and girls by taking a sample of 166 boys and 160 girls through cluster sampling technique and found that ascendance, vigorous and persistent temperaments were significantly and positively correlated with Mathematics achievement in girls; ascendance, accepting, vigorous, cooperative and tough minded temperaments were significantly and positively correlated with Mathematics achievement among boys; girls were better than boys in Mathematics achievement at high memory level.

Mehera (2004) explores a study on the achievement at secondary level with the objective to assess the students’ achievement in Mathematics, the nature of major learning environment, scientific attitude and attitude towards subject with a sample of 600 students of urban and rural areas of Burdwan district in West Bengal and found that achievement in Mathematics was significantly related to major learning environment; urban students showed significantly higher achievement in Mathematics, better learning environment and better attitude towards Mathematics.
leads to good academic scores; no sex wise difference was in achievement of students in Mathematics

Surekha (2008) studied relationship between students’ adjustment and academic achievement and found that boys and girls from private schools were well adjusted and academically performed better than boys and girls from government schools; co-efficient of correlation between students’ adjustment and academic achievement was -0.29, which was significant at 0.01 level, which indicates that low scores in adjustment tend to accompany with high scores in academic achievement.

Chaturvedi (2009) investigated the effect of school environment and certain demographic variables on achievement motivation and academic achievement of young adolescents. The respondents of the study were 300 students in the age range of 12-15 years of Bhopal. Percentages of marks obtained by the students in last three years were used as measures of academic achievement. The results indicated significant gender difference in academic achievement, the girls scored higher than boys significantly.

Elizabeth (2009) analyzed the family structure and the academic achievement of 549 African American students attending rural and urban high schools in North Carolina. The results demonstrated that the female students attending both the rural and urban high schools had significant higher academic achievement levels than the male students. Results also indicated that rural students performed better than urban students.

Garikai (2010) empirically predicted the causes of poor academic performance of the school students on a sample of 200 high school students of Zimbabwe. Data were gathered through interview conducted with the students. The findings indicated that there was a difference in academic performance of male and female students with male students performing better and education of parents had significant effect on academic achievement of the students.

Sarsani and Ravi (2010) investigated achievement in mathematics of secondary school students in relation to selected variables. The sample of the study consisted of 480 boys and girls, drawn from the various private and government high school of Warangal city in Andhra Pradesh. Data was collected by administering scholastic achievement test of mathematics to the sample. The findings indicated significant difference between the mathematics scholastic achievement of the boys and girls. The result also showed that girls were higher achievers than boys.
Bormi Conrad Sumer (2010) conducted a comparative study of X grade students in Mathematics under three institutional setting in Shillong. The main aim of his study is to find out the Mathematics marks obtained by X grade students under three institutional setting of MBOSE, CBSE and ICSE of Shillong. He concluded that MBOSE and CBSE curriculum and system of evaluation work equally well for both boys and girls, as he found that boys and girls do equally well in mathematics. But, the ICSE curriculum and system of evaluation do not work equally well for both boys and girls. The low score of marks obtained by Icse students may be due to the mathematics paper is divided into three papers of 100 marks each.22

In fact, problem solving is endorsed as a standard in the school mathematics curriculum by the National Council of Teachers of Mathematics (NCTM, 1989; 2000). Numerous research studies in the past decades have studied ways to enhance students’ problem solving skills (for examples Cai, 1994; Garofalo & Lester, 1985; Krulik & Rudnick, 1989; Lawson & Chinnappan; 2000; Lester, 1994; Schoenfeld, 1979). In Malaysia, Lee (2001) has reviewed studies in mathematics education and noted the increasing interest in the area of problem solving.

It is the worthwhile search for mathematical growth that has researchers looking for ways by which one may use problem solving as a teaching tool. The Principles and Standard s for School Mathematics (National Council for Teachersof Mathematics, 2000) describes problem solving based teaching as using “interesting and well-selected problems to launch mathematical lessons and engage students. In this way, new ideas, techniques and mathematical relationships emerge and become the focus of discussion. Good problems can inspire the exploration of important mathematical ideas, nurture persistence, and reinforce the need to understand and use various strategies, mathematical properties, and relationships” (p. 182). This succinct statement encompasses about two decades of research and reflection on the entire gamut of issues related to problem solving in mathematics education. Even so, researchers continue to grapple with the issue of teaching via problem solving. Research on problem solving emphasizes the role of the teacher in developing students’ reasoning skill. Successful and unsuccessful problem solvers in mathematics differ with regard to knowledge, control and beliefs and affect factors. The review of the research literature on factors that contribute to students’ difficulty

in mathematical problem solving suggests that, the mathematics content level of the problems which students at different year levels of schooling will be able to solve successfully, and the different strategies or heuristics which students at different year levels use to solve the same mathematical problems must govern the design of problem-solving curricula at the various year levels of schooling, in the whole country in general, and in the state Meghalaya in particular, a similar type of study has not been seen to be carried out as yet. Moreover, the investigator also feels that the state of Meghalaya, being a state with a strong matrilineal customs, the comparison between the achievements of boys and girls may deviate from the national trend such as indicated in earlier findings. Whatever the findings may indicate, the investigator feels that the present study should probably yield some interesting results. Hence the investigator feels the need to carry out this study on the academic achievement in mathematics in relation to the problem solving ability of X class students in Jowai Town.