CHAPTER III  
REVIEW OF RELATED RESEARCH LITERATURE

3.1 INTRODUCTION

3.2 LAY OUT OF RELATED RESEARCH : ABROAD

3.2.1 Researches about process of problem Solving skill.

3.2.1.1 Research Study-1
Francis Sekyra III : Tapped Instruction Effect on Problem Solving Skill of Seventh grade Children.

3.2.1.2 Research Study-2
Barbara Anthony : Problem Solving process of fifth grade Arithmetic pupils.

3.2.1.3 Research Study-3
Joseph Guttann : Pupil's, Teacher's and Parent's causal attribution for problem behaviour at school.

3.2.2 Researches about problem solving and Other Variables

3.2.2.1 Research Study-1
Joseph M. Moreno : The Influence of Race and Social-Class Level on the training of Creative Thinking and Problem Solving Ability.
3.2.3 Researches about Different Programme and Problem Solving

3.2.3.1 Research Study-1
Edwina Hartshorn and John C. Brantley: Effect of Dramatic play on classroom problem solving ability

3.2.4 Researches about problem solving and school subjects

3.2.4.1 Research study-1
Robert A. Sedlak: Performance of good and poor problem solvers on Arithmetic word problems presented in a Modified cloze format.

3.2.5 Some More trends

3.3 LAY OUT OF RELATED RESEARCHES: INDIA

3.3.1 Researches about problem solving and other variables.

3.3.1.1 Research Study-1
Ajwani, J.K.: Problem solving behaviour in relation to personality, Intelligence and Age.

3.3.1.2 Second Research Study-2
B.C. Mishra: Relationship between creativity and problem solving ability at Different levels of Intelligence.

3.3.2 Researches about problem solving and School subjects
3.3.2.1 Research Study 1

3.3.2.2 Research Study-2

EPILOGUE
CHAPTER III

REVIEW OF RELATED RESEARCH LITERATURE

3.1 INTRODUCTION

The present chapter mainly deals with the review of the previous relevant literature. The purpose of this review is as under, which is in two folds: One, to study to what extent earlier investigations had been taken up in the identical areas, to which present research project is concerned and two, to find out the unexplored areas of studies. It is hoped too that through this review, certain corroboration may also be established between the earlier findings of various researches of the past and the results of the present investigation which will be discussed in the subsequent chapters.

The review of related study is nothing but a look into the past research works done in the specified fields. This is a very significant aspect of the research process as pointed out by William Wiersma:
"Educational Research is not or at least should not be carried out in any information vaccum."

This review of related studies helps the researcher by providing historical background of problem solving approach. It also helps foresee the limitations and scope of the study and to locate the research problem in the whole area of investigation, selecting the proper tools, sample and treatment or analysis of data. Moreover it helps to practice the conclusions of the research and to avoid ambiguities.

Hence accepting the importance of a review of the past work, the present investigator tries to go through the available literature and the research repeats and review them with special reference to the type of studies in problem solving approach.

3.2 LAY OUT OF RELATED RESEARCHES ABROAD

There are some researches in abroad about problem solving. Particularly there are researches about process of problem solving skill, problem solving and other variables, different programme and problem solving, and problem solving and school subjects.

3.2.1 Researches about process of problem solving skill

There are three researches for past review studies
about process of problem solving skill.

3.2.1.1 Research Study-1

Francis Sekyra III: Tapped instruction effect on problem solving skill of seventh grade children.

This study was done by Francis Sekyra III in 1970 at Mississippi state University and M. Ray Loree University of Alabama.

Sample:

Thirty six Ss randomly selected were from an average intellectual ability group of seventh grade students attending one Mississippi Junior highschool and exposed to six successive tape recorded problem solving practice periods.

Tools, Procedure and Result

Items contained in the tape record programmes were designed to assess and implement training in problem solving. The number of correct responses constituted a product measure problem solving. In addition to problem solving product measure were obtained on the problem solving subskills classified as: (a) extraction of information contained in the statement of a problem (b) retrieval of information.

1. Francis Sekyra III: Tapped Instruction Effects on problem solving skills of seventh Grade Children, Mississippi State University, M. Ray Loree University of Alabama, (Vol. 64, No.2. Oct, 1970).
(c) Combining operations required to arrive at the solution of problem. A 6x6 Latin square design with trend analysis was employed to ascertain whether practice in problem solving yield significant improvement in all four problems solving processes. The result indicated the increasing amount of practice in problem solving, implemented through exposure to taped programmes, yield significantly increase mental improvement on each of the four problem solving variables investigated. The results agree with and support the findings of previous research.

3.2.1.2 Research Study-2

Barbara Anthony\(^2\): Problem solving process of fifth grade Arithmetic pupils.

Two groups of fifth grade arithmetic problem solvers some better and some poor, were identified. Differences in process used by the groups were revealed by having each child solves several problems individually in presence of experimenter. These data were used to develop instructional programme that was studied by several of the poor problem solvers. Despite the extensiveness of the training significant effects did not occur for the trained children compared to a control group when measures were taken under conditions

similar to these of the training. The result of a more general test of arithmetic problems administered under normal classroom conditions make it clear that the group of trained poor problem solvers remained similar to the undertrained poor solvers in performance.

3.2.1.3 Research Study-3

Joseph Guttann: Pupil's, Teacher's and Parent's Causal Attribution for Problem Behaviour at school.

This study investigates the causal attribution of elementary school children, teachers and parents regarding problem nonacademic behaviour in school. The subjects were asked to grade and rank, the importance of each item in a list of 26 causal attribution compiled from previous answer of children from same population. The children's, Parent's and teacher's attribution patterns were compared and the children's pattern was checked against Weiner's attributional model.

The result in general show that children and teachers tend to play down the importance of reasons that related misbehaviour directly to themselves and attribute much

importance to reasons external to themselves. The results are discussed in the context of attribution theory in general and its applicability and meaningfulness for nonacademic behaviour in school.

3.2.2 Researches about problem solving and other variables

Some researches about problem solving and other variables are given below.

3.2.2.1 Research Study-1

Joseph M. Moreno⁴: The influence of Race and social class level on the training of creative thinking and problem solving ability.

The purpose of this study was to investigate the effective of a training programme in creative thinking and problem solving on children from varying racial background and social class level. The Ss were 218 fifth and sixth grade students. All Ss were administered the Torrance Tests of creative thinking form A. The experimental Ss participated in the eight week productive Thinking Programme and the

---

control Ss in the Gates-Peardon Reading Exercises. At the completion of the programme, all Ss were administered the Torrance T of C.T, form B. The result indicated the participation in the productive thinking programme enabled the students to improve their creative thinking and problem solving abilities. Neither race nor social-class level affected the child's ability to increase these skills.

3.2.3 Researches about Different Programme and Problem Solving

One research study is given below about effect of dramatic play on classroom problem solving ability.

3.2.3.1 Research Study-1

Edwina Hartshorn and John C. Brantley5; Effect of Drametic play on Classroom Problem Solving Ability.

The effects of Drametic play programme on problem solving skills were investigated. Students were twelve. Second and third grade students in an integrated school in a southern university community. One second and one third grade class participated in an 11 week dramatic play programme developed to teach social studies. Two other classes

one second and one third grade served as controls. Effect of the treatment were measured by problem solving test/comprehension type questions including items from the WISC, the WAIS and the Stanford-Binet administered at the end of the treatment to the twelve children who displayed measures. Results showed significant differences between the experimental and (control) classes on the problem solving test. Thus the dramatic play programme was concluded to have had a significant effect on problem solving ability.

3.2.4 Researches about problem solving and School Subjects

3.2.4.1 Research Study-1

Robert A. Sedlak⁶; Performance of good and poor problem solvers on Arithmetic word problems presented in a modified cloze format.

The performance of 9 years old EMR good and poor problem solvers was compared on test composed of problems written in modified cloze format, when closure was required on the verb subjects in the two groups did not differ significantly on MA, CA or IQ. The good problem solver

---

performed significantly better than poor problem solver on both extraneous and non-extraneous information modified cloze problems. For both groups the extraneous information problems proved to be harder than those without extraneous information.

3.2.5 Some More Trends

In a project of The American Educational Research Association, Travers had suggested some more trends and information about problem solving approach.

In addition to the following cited studies Travers edited several published reviews and/or analyses concerned with problem solving are available. Johnson (1944b) analyzed studies preceding 1944. Gorman (1967) analyzed research on word problems conducted between 1925 and 1965 and identified 37 studies that were of acceptable quality. Reidesel (1969) lists several procedures for improving problem solving based on research. Kilpatrick (1969) reports on the problem solving research from 1964 to 1969.

Several researchers have examined the structure of problems and the effect of reading skills upon the solution

of the problems. Burris and Yonally (1964) found that pupils made significantly higher score on problems in which the numerical data were in proper solution order, and Suppes, Loftus and Jerman (1969) reported that structural variables such as number operations were less important in determining problem difficulty than similarity of a problem to the previous problem. Steffe (1967) found that problems with a common name for sets (cookies, cookies) were easier for first-grade children to solve in an oral context than problems with different names for the sets (kitchen, goldfish).

Problem setting has also been found to be important to problem solving achievement (Bowman, 1929, 1932, Brownell 1931; Evans, 1940; Hensell, 1956; Lyda & Church 1964; Sutherland 1941; Wheat 1929). Their findings are mixed. However the generalizations that problems should be of interest to the children and relevant to lives are justifiable conclusions.

An excellent report on the state of the art at all grade levels including an extensive bibliography was given by Kilpatrick (1969). Seventh grade students did not significantly increase problem solving achievement as a result of being exposed to structure of the problem solving process in a study reported by Post (1968). A strong positive gain in problem solving ability at the eleventh-grade was reported by Wills (1967), to be the result of an experience of learning
by discovery. On the post-test covering general mathematical topics, the experimental group doubled their pre-test performance while the control group made only slight gains.

Travers (1967) has also developed an instrument for testing for problem preferences and found no significant difference in success between preferred and non-preferred problems.

3.3 LAY OUT OF RELATED RESEARCHES : INDIA

There are some researches in India about problem solving. Particularly the researches about problem solving and other variables, problem solving and school subjects.

3.3.1 Researches about problem solving and other variables

There are two studies about above subject.

3.3.1.1 Research Study-1

Ajwani J.K. * Problem Solving behaviour in relation to personality, Intelligence and Age.

In the Ph.D. thesis (1979) Ajwani has suggested the objectives, procedure, tools and findings of his thesis as under.

**Objectives**

The objectives of the study were:

(i) to find out the effect of personality, intelligence, age, sex and their interaction on the problem solving behaviour of students, and

(ii) to investigate the directions intended to assist the individual to bring about any improvement in the problem solving ability.

**Procedure**

The study was completed in two phases. In the first phase, the relation between the problem solving ability and the different variables was worked out and in the second phase the effect of direction on problem solving ability of the subjects was studied. The sample of the first phase consisted of 2,400 subjects, representing three age groups, i.e. 10-11 years, 14-16 years and 19-23 years. Of these the subjects scoring in the top 12.5 percent and the bottom 12.5 percent on factors B, C, I, Q and Q₄ of the personality tests were considered for the second phase— the experimental phase of the study.

**Tools**

The tools used in the study were the sixteen personality factor questionnaire, the HSPQ, the CPQ and the cul-
ture Fair Test, Scale 2 and 3. In order to measure the problem solving behaviour of the subjects, four puzzles were selected. Of these two were geometrical puzzles and two were mechanical. The two geometrical puzzles were the Square puzzle and the Match stick puzzle (the learning puzzles), while the two mechanical puzzles were the Ring puzzle and the Leaf and String puzzle (the experimental puzzle). Following a randomized-control group-design at the experimental phase, three experimental groups and one control group with equal representation of different age group under different experimental conditions were formed based upon the Klanseier's principles of improving the problem solving ability.

Findings

The findings of the study were:

(i) The subjects with facilitory personality traits proved better problem solvers than those having inhibitory personality traits.

(ii) The subjects with high intelligence proved to be better problem solvers than those with low intelligence.

(iii) The problem solving ability of the subjects increased with an increase in age.

(iv) No significant sex difference were observed in the subjects' ability to solve problems.

(v) The interaction between personality factors, intelligence, age and sex had no effect on the problem
solving ability of subjects.

(vi) The subjects of three experimental group performed significantly better than the control group, implying that the directions helped in increasing the problem solving ability of the subjects.

(vii) The assistance given in finding out the need, information and methods proved to be the most effective set followed by the experimental condition III and experimental condition I.

(viii) The effect of direction of the problem solving ability was found to be independent of other factors, that is facilitatory or inhibitory personality, high or low level of intelligence, young or old age and male or female sex.

3.3.1.2 Research Study-2

Mishra B.C.9: Relation Between Creativity and Problem Solving Ability at different levels of Intelligence.

In the above research note (1986) Mishra has suggested the hypotheses, method, sample, tools, procedure and the interpretation, as under.

--------------------------------------

The research has been undertaken in the field of problem solving ability.

**Hypotheses**

The research hypotheses formulated for verification are as follows.

(i) There exists significant positive correlation between creativity and problem solving ability.

(ii) There exists significant positive relationship between creativity, ability and problem solving of high intelligent students.

(iii) There exists significant positive relationship between creative ability of low intelligent students.

There are another four hypotheses in this study.

**Method**

For the present study, the correlation method was used.

**Sample**

A sample of 350 'X' grade students (209 boys and 141 girls) in various high schools in the district of Balasore (Orissa) were covered for the study. The cluster random sampling method was used by taking the class section as a cluster.

**Tools**

For the measurement of creative abilities, Wallach-Kogan tests of creativity in Oriya (i.e. adapted by Tripathy 1979) were used. The problem solving abilities were measured
by Dube's problem solving ability. This test (in Hindi) was adapted into Oriya. To measure the general intelligence of the students, Raven's Progressive Matrices were administered.

**Interpretation and discussion**

1. Creativity v/s Problem solving ability correlation coefficient between creativity and problem solving ability is 0.76 which is significant at 0.01 level.

2. High intelligence v/s creativity also significant at 0.01 level.

3. Low intelligence v/s creativity is also significant at 0.01 level. So low intelligence students are also creative.

4. High intelligence v/s Problem solving ability is significant at 0.01 level.

5. Low intelligence v/s Problem solving ability was also significant at 0.01 level.

6. High intelligence v/s creativity and problem solving ability is significant.

7. Low intelligence v/s creativity and problem solving ability is significant.

8. High intelligence creative v/s Low intelligence creative found highly significant at 0.01 level.

9. High intelligence problem solvers v/s low
intelligence solvers found highly significant at 0.01 level.

3.3.2 Researches About Problem Solving and School Subjects:

In India some researches have been carried out on problem solving school subjects, as given below.

3.3.2.1 Research Study-1


The main objectives and findings of this research are given below:

Objectives: The main objectives of the study were:

(i) to study thinking (problem solving) processes, evoked by individual problems, having a continuous chain of reasoning.

(ii) to study the same processes, appropriately grouped regardless of typology of problems.

(iii) to study the errors as they occurred in solving these problems.

(iv) to determine relationships between scores on thinking

and variables like intelligence, sex, various immediate test reaction to problems on presentation and adjustment.

(v) to find out the characteristics of successful and unsuccessful problem solvers.

(vi) to analyse the structure of the appropriately grouped processes of thought, functionality and interpret them psychologically, and

(vii) to point out the main educational implications for science teaching.

Findings

Significant finding of the study were:

(i) Ten factors were extracted using varimax method of rotation as under:

(a) Schematic learning-general
(b) adjustment factor
(c) Problem solving or problem orientation
(d) Sensing problem
(e) Symbolism
(f) Testing hypotheses
(g) Using constant difference in arithmetical situation
(h) Terned aspect characters
(i) .Seeing the problems as a whole, and
(j) Intelligence.
3.3.2.2 Research Study-2


In the Ph.D. thesis Rai had given objectives, procedure and findings as below:

Objectives

The objectives of the study were:

(i) to identify creative and non-creative students
(ii) to prepare problem solving tasks, and
(iii) to find out the difference in problem solving ability between the creative and the non-creative students.

Procedure

A set of tasks involving problem solving was developed for the purpose. The sample for the study consisted of 200 students from two secondary schools of Patna. In order to identify creative and non-creative students, the Creativity Test of Mehdi was used. The two groups of creative and non-creative were tested on problem solving tasks. In order to avoid experimental errors all the students were subjected to task performance in the same conditions.

Findings

The main findings of the study was that the creative and non-creative groups differed significantly in their

problem solving ability. There was thus need for assigning more tasks to the creative students after they were identified. The assignment of problem solving task in science should be in accordance with the degree of creativity. Further, the finding was of much use to curriculum planners and science teachers in the sense that the same problems or the same set of problems in science could not work gainfully with all the students in the classroom.

3.4 EPILOGUE

The improvement of problem solving skill has been the topic for more research studies than any other single topic. The quality of this research has been generally low in research design. However, even with limitations considered, there are probably more practical answers from research to help the improvement of problem solving than for any other area of the elementary and secondary school mathematics curriculum.

Mathematical problem solving was studied rather extensively from several points of view and probably deserves a designation as a "branch" of mathematics education
as much as any other topic which might be named. At the secondary school level, where problem solving would seem to come into its most important role, few empirical studies were found.

The review of the related researches helped the investigator to select the independent variables and a research method pertaining to the problem in hand. Moreover, it also helped the investigator to prepare a research design, tools, procedure and findings appropriately for the problem and its objectives.