CHAPTER 8

SUMMARY

When we act with a goal in mind but with no clear or well defined way to explore and the initial attempt at solution goes begging, we call it the problem situation. When the motivation keeps one going with warded in the direction of the solution, the behaviour is termed as problem solving. A problem has various possible causes as well as its solution. There is no standard catalog of problem-solving processes, but there is a large amount of experimental evidence on organizing and reorganizing cognitive structures. Gestaltists and contemporary behaviourists have tried to explain the process of problem solving in their own set ways.

There are several stimulus and organismic factors which have been found to affect the problem-solving behaviour. Complexity of the task, familiarity with it, abstractness, and embedding are some of the important stimulus factors, whereas set, personality structure, intelligence, age, and sex can be exemplified as the organismic factors contributing to the problem solving. Set is an attitude which is developed
either by instructions or directions from some one or by
one's own previous responses. It is known chiefly from its
facilitatory and inhibitory effects on behaviour. The set has
been found to improve the problem-solving ability in several
ways (Klausmeier, 1961). The set activates solvable problems
in the learning situation, assists the learner to state and
delimit the problems, helps in finding the needed information
and methods, aids the person to interpret and analyse
information and methods, provides opportunities for stating
and testing hypotheses, and encourages independent discovery
and evaluations.

Another organismic factor, the personality structure
of the individual, is also an important factor which affects
the problem-solving behaviour. It either facilitates or
inhibits the efficiency to deal with the problems of life.
There are a large number of studies (e.g., Robinson, 1940;
Goldstein, 1941; Szekly, 1943; Kempler, 1962; Rosenhan, 1963;
Mendelson and Gerald, 1970; Rao, 1970; Gavrin and Norgatroyd,
1973; Grigorian et al., 1974; and Orne Kathleen, 1975) which
have attempted to explore the relationship between the
personality traits and the problem-solving behaviour.

Intelligence is considered as the ability to solve
the general run of problems and hence is treated as one of
the main determinants of the problem-solving efficiency.
Billings (1934), Merrifield et al. (1934), and Leerverson (1969) have found significant differences in the performance of the high and the low intelligence groups on a problem-solving task.

Age, too, has been found to play an effective role in problem solving. Many investigators (e.g., Alpert, 1967; Hethes, 1931; Maier, 1936; Wetherick, 1964; Veronin et al., 1970; Strayowski, 1973; Somerville, 1974; Brinley et al., 1974; Robarge, 1976; and Elliot et al., 1977) have found a positive correlation between successful solutions of problems and the chronological age. Heidbreder (1925) found that increased responsiveness to the problems and a gradual emergence of more definite modes of procedure are the two major results of increases in age. Rimelid (1974) reasoned that the children use different logical approaches to problems as they advance in age.

Male-female differences in the problem-solving behavior have also been reported by quite a few psychologists (Billings, 1934; Maier, 1945; Guitelov, 1951; Sweney, 1953; Sangsetad, 1955; Carey, 1962; Milton, 1957, 1959). But Strayowski (1973) did not notice any significant difference between the performance of the males and the females on a problem task. Greenberger et al. (1971) noted that where problem solving involved the manipulation of objects and the ability to break set or to try a range of approaches, boys excelled the girls.
Garai and Scheinfeld (1965) and Matt (1972) found males' superiority over the females on the problems requiring restructuring.

The purpose of the present investigation was to analyze the process of human problem-solving under different verbal instructions and observe its effect on the subjects with varying personality, intelligence, age, and sex. The intent of the author was to trace out the relationship between personality and the problem-solving behavior on the one hand and between intelligence and the problem-solving behavior on the other. Besides, a study of the effect of positive sets on problem-solving behavior in general and in relation to personality traits, intelligence level, age, and sex in particular was also envisaged.

Cattell's 16 PF, HSPQ, and CPQ were administered on a large sample of 2,400 students (distributed in three age-groups - 10-11 years, 14-16 years, 19-23 years) of Raipur city. This sample comprised 1200 boys and 1200 girls. Two hundred boys and girls (keeping ratio 3:2) from each age-group were selected for the final sample on the basis of the highest and the lowest 12.5% scores on the personality traits A, G, I, O, & Q4. Another sample consisting of 40 males and 40 females with personality trait M was selected from the age-group 19-23 years. With the same procedure,
subjects with second order personality factors I & III were also selected. To study the role of intelligence, a fourth sample of 40 students from each of the final sample of 600 was selected on the basis of extreme high and low IQ scores on Culture Fair Intelligence Scale.

The subjects in four samples were given four problem-tasks (two geometrical and two mechanical puzzles). As most of the subjects were unable to solve the mechanical puzzles, the data obtained on these two puzzles were left out in the final analysis of the problem-solving behaviour. The subjects in different sub-groups (formed on the basis of personality traits, intelligence, age, and sex, separately as well as two or more jointly) were divided into different experimental groups who were given different type of instructions with a view to improving the problem-solving ability as expected by Klaussmier (1961).

The data were analysed through the analysis of variance, CR, and X² statistics. The obtained results are summarized below.

1. The first problem was to test whether the subjects of different personality, intelligence, age, and sex perform differently or not.

(a) It was found that persons with facilitatory
personality traits (e.g., first order factors B & C high; I, O, Q₄, & M low; and second order factors I low & III high in Cattell's system) proved to be better problem-solvers than those having the inhibitory personality traits (e.g., first order factors B & C low; I, O, Q₄, & M high; and second order factors I high & III low). This indicates that the subjects with high scholastic mental capacity (B high) and high ego-strength (C-high) excel those with lower scholastic mental capacity (B low) and low ego-strength (C low) in their problem-solving ability. Likewise, the subjects who have the sense of practicability and responsibility (I low), adequacy to deal with the problems without any trouble and anxiety (O low), low ergic tension (Q₄ low) or who are careful, conventional and proper (M low) show considerably better performance on problem-tasks as compared with those who are impatient and impractical (I high), depressed and troubled (O high), have high ergic tension (Q₄ high) or are careless (M high). In the same way, it is also evidenced that the subjects with low level of anxiety (second order factor I low) and who are enterprising and decisive (second order factor II I high) do much better in problem situation than those having high level of anxiety (second order factor I high) and who are emotionally disturbed (second order factor II I low). In a nutshell, it can be said that personality plays a decisive role in the problem-solving behaviour; certain
personality traits facilitate it while certain others inhibit it.

(b) Subjects with high intelligence were found to do better in problem situation than those with low intelligence. It implies that high intelligence makes the persons able to solve their problems with better reasoning and with greater ease.

(c) The problem-solving behaviour of the subjects in three age-groups - 10-11 years, 14-16 years, and 18-23 years - was studied. The results show that the problem-solving ability increases with advances in age. It ascertains that the increase in age enables the individuals to acquire more knowledge and independent means of securing information. They start making better discriminations, associating more and new meanings with their experiences, and remembering previous experiences better; also, they can better integrate, abstract and generalize. Emotional maturity also comes through age. All these result into more efficient problem-solving.

(d) The findings of the present research do not subscribe to the idea that the males would excel the females in solving the problems. It seems that the males and the females have nearly the same ability to solve the problems used in the present study.
2. The joint effect of any two or three variables on the problem-solving ability was also studied. The interaction measures the extent to which the effect upon the dependent variable (i.e., problem-solving behaviour) of changing the level of one independent variable (i.e., age) depends on the level of others (i.e., personality, intelligence, and/or sex). None of the interaction effects was found significant indicating that all the four factors — personality, intelligence, age, and sex — considered in the present investigation are independent in regard to their effects on the problem-solving behaviour. Thus, with advances in age, for example, the ability to solve problems increases equally for the subjects of any type of personality, intelligence level, and sex. Similarly, the subjects with facilitatory personality traits excel the subjects with inhibitory personality traits equally irrespective of their sex.

3. A relatively more important purpose of the present investigation was to study the effect of directions on the problem-solving behaviour. The subjects in all the main and sub-groups were divided into four instruction-groups. In Control Condition no any direction was given while in other three experimental conditions some instructions (based on Klemmeier's principles) were given with a view to facilitate problem solving. The subjects of Experimental
Group I were helped in stating and delimiting the problems; the subjects of Experimental Group II were assisted in finding the needed information and methods for getting the correct solution; and the subjects in Experimental Group III were aided to interpret and analyse the information and methods. It was found that, in general, the subjects in different Experimental Conditions performed considerably better than the subjects of the Control Condition. Assistance given in finding the needed information and methods (Experimental Condition II) proved to be the most effective set, the next being the instructions which aided the learner to interpret and analyse the information and methods (Experimental Condition III). Though, the help in stating and delimiting the problems (Experimental Condition I) did not prove of much use, it tended to improve the performance slightly as compared with the 'no help' given to the Control Group.

4. The effect of direction on the problem-solving behaviour was studied in relation to personality, intelligence, age, and sex. The findings revealed that the effect of direction on the problem-solving ability is independent of other factors; that is, facilitatory or inhibitory personality, low or high level of intelligence, young or old age, and male or female sex of the subject does not help him in gaining from the directions. On the other hand, all the subjects,
possessing, for instance, either facilitatory personality traits and high intelligence or inhibitory personality traits and low intelligence profit equally from the directions in problem solving. Likewise, male or female subjects in any age-group and having any type of personality get equal benefit from the directions.

To sum up, the problem-solving efficiency depends on the personality, intelligence, and age of the subject to a considerable extent whereas sex plays no significant role in this regard. Direction is also found to exert facilitatory effect and, thus, helps to improving the problem-solving ability. Interestingly, the personality, intelligence, and age are found to play only independent, and not joint, role in problem-solving as well as in gaining from the directions in problem solving.