CHAPTER II

REVIEW OF RELATED STUDIES

Unlike other animals, that must start a new with each generation, man builds upon the accumulated and recorded knowledge of the past. For a research worker, it is indispensable need to be thoroughly familiar with the previous research in the related field. By going through the previous studies, investigator comes to know that his problem does not exist in a vacuum and that considerable work has already been done on problems which are directly or indirectly related to his field of investigation. A review of the related literature is an integral part of the conduct of research. It may provide guiding hypotheses, suggestive methods of investigation and comparative data for interpretive purposes. It also helps the investigator to avoid duplication. It is also helpful in planning of an adequate research design and insightful interpretation of his findings.

2.1 Training Strategies and Creative Problem Solving Skills

Various techniques or programs for the enhancement of creative thinking have been developed by Crawford (1954), Gordon (1961), Osborn (1961), Feldhausen et al. (1971), Edward de Bono (1972), Covington et al. (1974), Parnes et al. (1977). A wide variety of such programs have been described by Stein (1974, 1975) and Mansfield et al. (1978).
Ros and Lin (1984) found that training in creativity generally raises various divergent thinking abilities at least moderately. Originality and fluency are particularly strengthened through training.

Study conducted by Parnes and Noller (1973) indicated dramatic gains under favourable conditions of high motivation and appropriate training.

Results of clinical studies have found that students can be taught to solve problems, to ask questions that assist in understanding the problem and to use specific strategies although it may limit their flexibility (Putt, 1978).


Jariah (1981) stressed discovery method, activity method and creative teaching method useful for enhancing creativity. Hooda and Jariah (1983) studied the effect of mastery learning strategy on various dimensions of non-verbal creativity namely fluency, flexibility, originality, elaboration and total score in non verbal creativity. Experimental group gained significantly on fluency (t = 6.88), flexibility (t = 6.24), originality (t = 4.61), elaboration (t = 4.68) and total non-verbal creativity (t = 6.33) at 0.01 level.

Sreelatha and George (1981) studied the effect of creative teaching on creative thinking process of adolescents studying in 9th class. After one
month it was inferred that verbal fluency, verbal flexibility, verbal originality, verbal elaboration, non-verbal elaboration and non-verbal originality scores were higher in post-test and t-values were significant at 0.01 level.

Zalina (1982) noted biggest gains in originality, fluency and flexibility through some instructional programs developed for enhancing creativity.

McBratney (1983) assessed the effectiveness of right brain instruction on the CTBS scores in language, arts areas of reading, language and spellings. It was concluded that students receiving right brain instruction scored significantly on language subtests of CTBS, but scores on reading and spelling subtests were not statistically supported.

Grayson (1986) conducted a study to assess the effect of training to facilitate the use of cognitive strategies in creative thinking and mathematical problem-solving. The results indicated that training was not effective in increasing either number or quality of creative responses or the number of mathematical problems solved. On TTCT, grade 5 students scored higher on fluency, flexibility and originality, while grade 8 students received higher scores for elaboration and restructuring. 8th graders solved significantly more mathematics problems than 5th graders.

Myares (1986) determined the effect of Scamper technique and anxiety on creativity enhancement. Significant differences in pre-test and post-test scores were found regarding originality and elaboration for
experimental and control groups. Pre-test scores on fluency, flexibility, originality and elaboration explained 31, 15, 7 and 26 per cent of the variance in residual scores on each one of the post-test measures of creativity respectively. The investigator found the Scamper technique was not feasible in this experimental situation and recommended to use only one form of TTCT, figural, instead of the parallel forms on a large sample size and more diverse population.

Shaklee (1986) studied the effectiveness of teaching creative problem-solving techniques to enhance the problem-solving ability of KG students. There was an increase in the fluency scores of experimental groups with afternoon class generating slightly more ideas.

Barbara and Torrance (1986) studied the effect of a training program (SEAM) for developing problem identification skills. No training group (N = 10) had a mean score of 5.4 on problem identification assessment test and group with SEAM training had a mean of 18.7 on the assessment which was significant at 0.01 level.

Barton (1987) made a developmental study of problem-solving strategies in learning disabled and non-learning disabled boys and found that ability to make use of specific problem-solving skills was highly influenced by variation in stimulus characteristics. Brief training was effective in improving performance of all subject groups on trained and untrained material at post-test and follow up trials.
Chukwu (1987) determined the effects of heuristic instruction on ability of 8th and 9th grade students in solving mathematical problems and found it superior to traditional method.

Lewis (1987) determined the effects of specific concrete experiences on problem-solving ability requiring logical thinking. It was an effective instructional technique for improving problem-solving ability related to logical thinking.


Some studies though a limited number, established that through training creative thinking can not be enhanced. Sampascual (1982) suggested that creativity is heritable and has little possibility of being developed. Carter (1984) studied the effects of a multimodal creativity program on the creativity of 12 grade students. But the treatment did not significantly improve the creativity of its students.

2.2 Training Strategies and Cerebral Dominance

Gazzaniga (1971) indicated that modifications in the tendency to rely on one or the other hemisphere during problem-solving is possible through some reinforcement contingencies, whereas Bever and Chiarello (1974) concluded that it can be achieved through direct extensive training.
Bogen et al. (1972) suggested that a person's two hemispheres are able to function in a complementary manner, therefore, improvement in the right hemisphere function results in the integrated mode of learning.

According to Samples (1975) different methods, materials and procedures are required for the development of right hemisphere. These procedures are different from the traditional ones.

Reynolds and Torrance (1978) indicates that it is possible to modify a person's preferred style of learning and thinking over relatively brief periods of time (6 to 10 weeks). Not only changes are possible, but it seems that the general direction of the changes can be controlled. As more is learned about the mechanisms controlling the development and alteration of styles of learning and thinking, it may become possible to train individuals to modify their information processing procedures to best fit the demands of their lives.

McGuire (1983) made an exploratory investigation of the relationship between cerebral dominance as measured by SOLAT and problem-solving strategies used by selected high school chemistry students. A relationship between cerebral dominance, as measured by SOLAT, and problem-solving strategies used by subjects was determined to be statistically significant.

Florey (1985) conducted a study to investigate if enhancement of integrated mode of thinking was possible. 3 intact groups of 6th grade were pre-tested and post-tested with Your Style of Learning and Thinking.
FORM CC to assess left, right and integrated cerebral hemispheric preference. The experimental (skills) group worked in the Future Problem-solving activity Book, while experimental (content) group completed a Future Problem-solving Practice. No treatment was given to control group. It was concluded that direct training of 6th grade students using CPS skills enhances integrated processing.

Young (1981) found that 70 per cent of experimental subjects who used right brain instructional techniques, made a shift in thought processing from L-mode to R-mode and were more positive towards mathematics.

Raina (1984) proposed that right brain can be cultivated by stimulating greater sensitivity through the technique of actively guiding the child to more differentiated perception. It may become possible to modify individual's information processing procedures which has implications for the field of problem-solving.

Mitchell and Wilken (1986) studied the change in hemispheric functioning through direct training in creative thinking. Results of the data analysis revealed a statistically significant decrease in the scores of test items representing left hemisphere style of learning and thinking. A comparatively small non-significant positive change in the scores was noted in right hemispheric responses. A non-significant score increase also incurred in the integrated classification.

2.3 Intelligence as Related to Creative Problem-Solving Skills and Cerebral Dominance

Sinha (1968) found that higher intelligence facilitates to complete problem-solving tasks, concept formation and attainment.

According to Torrance and Reynolds (1978) training in simultaneous processing (i.e. right hemisphericity may very well enhance the creative skills of high IQ children. Right hemispheric, high IQ children display higher levels of creativity.

Shuell (1983) suggested that learning of poor learners can be improved if they are provided proper training.

Bell (1986) studied the influence of age, intelligence and training on the acquisition of a formal operational concept and concluded that high intelligent subjects had a greater frequency of correct responses.

Myers (1986) examined the relationship between problem-solving abilities known as analysis, synthesis and evaluation and general intelligence of fourth, fifth and sixth grade gifted students but could not find any significant relationship between problem-solving skills and children's level of general intelligence on all subtests of Ross and WISC-R. Gifted have the potential for high levels of problem-solving skills.

Roberts et al. (1986) indicated that more intelligent students are assumed to require less instruction than their less-intelligent peers in learning new concepts and skills.

Russo (1989) made a comparative study of creativity and cognitive problem-solving strategies of bright and average students and found no significant differences between problem-solving strategies
of bright and average children. It was concluded that problem-solving and creativity, not IQ, underlie creative achievements.

Regarding the relationship between intelligence and hemisphericity, meagre information is available. Das et al. (1979) insisted that hemisphericity exists at all levels of general mental ability.

Reynolds (1981) referred hemisphericity as psychological intelligence which is more directly related to specific methods of information processing.

Fanning (1983) found correlation between hemispheric preference and IQ significant at 0.001 level for 4th grade, not significant for 5th grade and significant at 0.01 level for 6th grade.

2.4 Personality as Related to Creative Problem-Solving Skills and Cerebral Dominance

The association of personality with problem-solving skills has been investigated by many researchers. Stephanov and Semenov (1982) suggested that for the development of successful problem-solving strategies, one must take in consideration personality aspect also.

Cattell (1955) regards creative person as a self-sufficient introvert but Chadha and Sen (1981) found that extraversion was related to creativity for males.

Honess and Kline (1974) found that with youngest age group extraversion was related to academic success especially among girls (P < 0.01). With oldest girls extraversion changes sign: introversion is more important for success, whereas Gover (1976) could not find any relationship between the two variables.
Cooper (1979) and Haley (1979) also found contradictory results. Former indicated that certain personality traits were related to ability achievement sub-groups, while latter could not find any relationship between personality factor and learning by any strategy traditional or non-traditional.

Haley (1979) studied the effects of personality factors and varying levels of student involvement on knowledge gained in a college level earth science course and found that personality factors do not seem to facilitate or inhibit learning by either strategy traditional or non-traditional.

Russo (1989) found that meta cognitive strategies and personality variables seemed to influence creativity and problem-solving.

Not much work has been done in the field of hemisphericity and personality relationship. Eysenck (1967) showed marked differences in attentional capacity between introverts and extraverts in terms of unidimensional notions of brain arousal, the attentional style of introverts suggests activation specifically. With the constancy provided by redundancy bias, introverts excel in task requiring sustained vigilance (Krupski et al., 1971).

Stelmack et al. (1979) indicated that extraverts habituate rapidly to unchanging input. According to Eysenck (1981) extraverts are less distracted by competing stimuli, possibly due to greater facility for parallel processing (right brain) rather than sequential processing (left brain). Ordering of cognitive operation is a left hemisphere task, whereas parallel processing is adapted by right hemisphere (Bradshaw and Nettleton, 1981).
so as to explore creative potentialities of students.

Parallel with the development in creative thinking research is "dual hemisphere" or "whole-brain" research. Krueger (1976) and Torrance and Reynolds (1978) stressed the role of right hemisphere style in problem-solving and creative thinking, whereas traditional teaching strategies appeal to and develop primarily the left hemisphere (Samples, 1975). It has been further stated by Torrance (1981) that training in simultaneous processing (i.e. right hemisphericity) may very well enhance the problem-solving skills of children. Modifications in the tendency to rely on one or the other hemisphere during problem-solving is possible through some reinforcement contingencies (Gazzaniga, 1971), direct extensive training (Bever and Chiarello, 1974) and some other types of specific training (Reynolds and Torrance, 1978; Grissom et al., 1982).

The underlying assumption of the present study is that students may be given left as well as right hemisphere training so that empirical analytical, linear and rational kinds of thinking (left brain functions) may be integrated with special, invaluable contributions of the right brain. The investigator proposes that development of neurological symmetry i.e. integrated brain may be facilitated by training the right hemisphere and consequently creative problem solving skills may be acquired.

2.7 Statement of the Problem

THE EFFECT OF TRAINING STRATEGIES ON CREATIVE PROBLEM SOLVING SKILLS AND CEREBRAL DOMINANCE IN RELATION TO INTELLIGENCE, PERSONALITY AND COGNITIVE STYLE.
2.8 Objectives of the Study

The study was undertaken keeping in view the following objectives:

1. To determine whether the training strategies effect creative problem-solving skills and cerebral dominance or not.
2. To study if the intelligence, personality and cognitive style effect the creative problem-solving skills.
3. Whether intelligence, personality and cognitive style effect the cerebral dominance.

2.9 Hypotheses

The study was designed to test the following hypotheses:

Hypotheses Concerning Creative Problem-solving Skills

Main hypotheses

1. Groups given training through strategy, A₁ and strategy A₂ will not differ significantly on mean gain scores for (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.
2. There will be no significant difference in mean gain scores of (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals of high intelligent and low intelligent subjects.
3. Extraverts and introverts will not differ significantly in terms of mean gain scores for (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.
4. Cognitive style will not account for significant variance in mean gain scores for (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

Interactional hypotheses

1st order

5(i) There will be no significant interaction between training strategies and levels of intelligence in respect of mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

(ii) Interaction between training strategies and personality types will not significantly effect mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

(iii) The training strategies A₁ and A₂ will be equally effective for field-independents and field-dependents in respect of mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

(iv) There will be no significant interaction between levels of intelligence and personality types in terms of mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

(v) Levels of intelligence and cognitive style will have non-significant interaction in respect of mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.
(vi) Interaction between personality types and cognitive style will not be significant in case of mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

2nd order

6(i) There will be no significant interaction among training strategies, levels of intelligence and personality types in terms of mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

(ii) Training strategies, levels of intelligence and cognitive style will not interact significantly with respect to mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

(iii) Interaction among training strategies, personality types and cognitive style will not be significant for mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

(iv) Levels of intelligence, personality types and cognitive style will have non-significant interaction in terms of mean gain scores on (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

3rd order

7. There will be no significant interaction among training strategies, levels of intelligence, personality types and cognitive style with
respect to mean gain scores for (a) fluency, (b) flexibility, (c) originality and (d) creative problem-solving skill totals.

**Hypotheses concerning Cerebral Dominance**

**Main hypotheses**

8. Groups taught through strategy A1 and strategy A2 will not differ significantly with respect to mean gain scores on (a) whole brain, (b) left brain and (c) right brain.

9. High intelligent and low intelligent subjects will not differ significantly in terms of mean gain scores on (a) whole brain (b) left brain and (c) right brain.

10. There will be no significant difference in respect of mean gain scores for (a) whole brain, (b) left brain and (c) right brain of extraverts and intraverts.

11. Cognitive style will not affect significantly mean gain scores of (a) whole brain, (b) left brain and (c) right brain.

**Interactional hypothesis**

1st order

12(i) Interaction between training strategies and levels of intelligence will not be significant in respect of mean gain scores for (a) whole brain, (b) left brain and (c) right brain.

(ii) There will be no significant interaction between training strategies and personality types with respect to mean gain scores on (a) whole brain, (b) left brain and (c) right brain.
(iii) Field-independents and field-dependents will not have significant interaction with training strategies for mean gain scores of (a) whole brain, (b) left brain and (c) right brain.

(iv) Levels of intelligence will not interact significantly with personality types in respect of mean gain scores on (a) whole brain, (b) left brain and (c) right brain.

(v) There will be no significant interaction between levels of intelligence and cognitive style for mean gain scores of (a) whole brain, (b) left brain and (c) right brain.

(vi) Personality types and cognitive style will have no significant interaction with respect to mean gain scores on (a) whole brain, (b) left brain and (c) right brain.

2nd order

13(i) Interaction among training strategies, levels of intelligence and personality types will not be significant for promoting gains on (a) whole brain, (b) left brain and (c) right brain.

(ii) Training strategies, levels of intelligence and cognitive style will have no significant interaction with respect to mean gain scores on (a) whole brain, (b) left brain and (c) right brain.

(iii) There will be no significant interaction among training strategies, personality types and cognitive style for mean gain scores on (a) whole brain, (b) left brain and (c) right brain.
(iv) Levels of intelligence, personality types and cognitive style will not interact significantly for mean gain scores on (a) whole brain, (b) left brain and (c) right brain.

3rd order

14. Interaction among training strategies, levels of intelligence, personality types and cognitive style will not be significant with respect to mean gain scores on (a) whole brain, (b) left brain and (c) right brain.