CHAPTER-8
SUMMARY

8.1.0 Introduction

‘Ability to think’ is an ultimate human resource which needs to be encouraged among learners of all ages. Traditional education system is concerned with information only. Even if we have complete information, we need ‘thinking’ in order to make use of that particular information. We also need thinking in order to avoid getting overwhelmed and confused by all the information, and for creativity, design, enterprise and doing anything new. Earlier supposed to be innate and inherent, it is now proved to be trainable and learnable. In his study Ristow asserted that direct teaching of thinking skills can produce better thinkers that are more creative. Further a large number of researchers (like Bass and Parkins 1984, Robinson 1987, Freseman 1990, Barba and Merchant 1990, Kagan 1988) have emphasized that thinking skills instructions also enhance academic achievement. So it becomes imperative to pay more attention to ‘thinking’ in education also.

The traditional thinking have put very high emphasis on critical thinking, arguments, analysis and logic, but these are only a part of thinking and it is very dangerous to assume these are sufficient. In addition to argument we need exploration of the subject, in addition to analyse we need the skill of design and in addition to logic we need perception. To attain all the above concepts, the modern form of thinking is Lateral, Creative and Parallel Thinking. Parallel thinking means thinking in the same direction at a time as defined by de Bono. It is a notion of co-operative thinking and a focus on exploration and design rather than analysis. The principle that drives parallel thinking is organization of thought. It promotes the idea that one must organize his thinking and try not to engage on too many trains of thought all at the same time.

Another type of thinking which is also important is ‘Lateral Thinking’. De Bono defines lateral thinking as methods of thinking concerned with changing concepts, perceptions and ideas. It aims to set the mind free from the imprisonment caused by already established thinking patterns and generating new ideas. Many different teaching methods and strategies have been put forward to develop various types of thinking skills over the years. But developing parallel and lateral thinking have already became pedagogical challenge to modern educationists. The present study
revolved around one of such strategies called ‘Six Thinking Hats’ strategy invented by De Bono early in 1980’s. This is very simple and practical way of carrying out parallel and lateral thinking. The Six thinking hats represent six modes of thinking and color of each hat indicates direction to think. This strategy ensures one sort of thinking at a time by wearing metaphoric colored hat. It helps people be more productive, focused and mindfully involved. Six Thinking Hats strategy systematically provides an opportunity for parallel thinking, lateral thinking and creativity in an environment that is free of the criticism and confrontation. Through this strategy, students get an opportunity of understanding the topic, text or issue from various perspectives. The strategy makes their mind free and helps them to be more creative and come up with new and alternate ideas. Moreover as the students will be more clear about the topic, they would be able to put forth their view-point with confidence. Hence, argumentation can be improved to much an extent. Thus this strategy helps the people to look at problems, decisions and opportunities systematically to generate more, better ideas and solutions. De Bono (1985) distinguishes six modes of thinking, with six colored thinking hats as given below:

White Hat thinking focuses on the facts, information available.
Red Hat thinking looks at a topic from the point of view of emotions, feelings and hunches. Black Hat thinking examines the difficulties and problems associated with a topic. It includes logical negative thoughts.
Yellow Hat thinking focuses on benefits and values related with a topic. It is based on logical constructive thoughts and positive aspects.
Green Hat thinking requires imaginative, creative, provocative thoughts and lateral thinking about a topic.
Blue Hat thinking focuses on reflection, metacognition, thinking about the thinking process and “mapmaking” thinking.

The colours help the students to visualise six separate modes of thinking and to convey the meaning of that thinking. To use Six Thinking Hats as teaching strategy for Indian High School students is the main attribute of the present study.

8.2.0 Rationale of the Study

In order to deal with rapidly changing world of today where new concepts and ideas are needed, educationists and philosophers are feeling urgent demand of new types of thinking because the conventional argumentative thinking is aimed most of the times
at killing ideas creativity and it lacks the constructive energy. The education system is so information oriented and examination centred that it gives readymade answers killing the natural tendency of students to think, explore and to design. It is particularly designed to cultivate the verbal, rational and sequential thought based on left hemisphere, resulting in the right hemisphere of every student being ignored. There is an essential requirement of such teaching strategy which encouraged students to think with all perspectives by using whole of the brain. Six Thinking Hats strategy fulfils all these conditions and provides a very convenient way to switch thinking or to ask for a certain type of thinking at a time. So, this strategy encourages full spectrum thinking and based on strategic thinking. Strategic thinking means- having a vision for the future, having a vision rooted in an understanding of the past, understanding the bigger picture, understanding what is happening on the ground, seeing things from different perspectives, challenging conventional wisdom, placing creative ideas in a context of a world that is to unfold i.e. not just foreseeing an expected future but constructing a future that might be. This type of strategic thinking is essential for development of human race.

While a lot of researches have been done in the field of critical and creative thinking, very less has been done in the field of parallel and lateral thinking, which is must to cope with the changing needs of the society as well as is much helpful in making discoveries and finding best solution of a problem. This strategy is widely used in Business sector but it is equally beneficial in Education sector also. After seeing its values and benefits in education many countries have adopted this method in school curriculum, like Venezuela (1995). Although Indian Education System has started recognizing urgent need to include ‘cultivation of thinking’ in curriculum yet no such provision for the same is suggested even in National Curriculum Framework (2005).

So, there is a huge need to train students to think clearly about a problem, generate options, think critically to select best option, develop confidence, inspiring a vision for a better future. Six Thinking Hats strategy provides such a platform to students and teachers where they can learn to think in a parallel and lateral way in an easy and interesting manner. Hence there is a strong need to explore the possibility of introducing Six Thinking Hats strategy at high school level. Many countries have started research programmes for effectiveness of this strategy but it is very scanty under Indian environment.
Keeping all these views in mind the present study was planned and undertaken for high school students.

8.3.1 Statement of the problem:

“EFFECTIVENESS OF SIX THINKING HATS STRATEGY ON THE DEVELOPMENT OF PARALLEL THINKING, LATERAL THINKING AND GENERAL CREATIVITY IN HIGH SCHOOL STUDENTS”

8.3.2 Operational Definitions of key words: -

I Six Thinking Hats strategy:

Six Thinking Hats strategy has six colored metaphoric hats and each color of the hat represents a different mode of thinking. This is a system of conscious thinking that focuses an individual’s thinking in a specific direction for a specific period of time. It is a simple, effective parallel thinking process that helps people to be more productive and mindfully involved. It requires students and teachers to extend their way of thinking about a topic by wearing a range of different thinking hats. The same definition of Six Thinking Hats strategy is adopted in the present study.

II Parallel Thinking:

Parallel Thinking means everyone is thinking in the same direction not attacking the thought of others. It allows the brain to maximize its sensitivity in different directions at different times. In parallel thinking, main focus is on exploration and design rather than analysis. The term parallel thinking has been defined in the same context in the present study.

III Lateral Thinking

Lateral thinking is concerned with changing perceptions, concepts and ideas. It covers thinking that sets out to explore and to develop new perceptions instead of just working harder with the existing perceptions. It is specifically concerned with changing preconceived notions to bring out new ideas. The same definition has been used in the present study.
IV General Creativity:

General Creativity is concerned with the thinking that helps an individual to create, discover or produce a new idea or object including the re-arrangement or reshaping of what is already known. De Haan and Havighurst (1961) stated that creativity is the quality which leads to the production of something new, may be new to society or merely new for the individual who created it. The term general creativity has been defined in the same context in the present study.

V High School Students:

High school students mean those students who are studying in IX class taken in the present study.

8.3.3 Objectives of the Study:-

1. To study the effect of Six Thinking Hats strategy on Parallel thinking of high school students.
2. To study the effect of Six Thinking Hats strategy on Lateral thinking of high school students.
3. To study the effect of Six Thinking Hats strategy on General Creativity of high school students.
4. To study the effect of Six Thinking Hats strategy on Argumentativeness of high school students.

8.3.4 Hypotheses of the Present Study

In absence of any research evidences, null hypotheses were framed in order to achieve the objectives of the study. The reason being that it was the only testable form of hypotheses and there are not many studies with the researcher to form directional hypotheses. Following were the hypotheses framed:

1. There is no significant effect of Six Thinking Hats strategy on Parallel thinking of high school students.
2. There is no significant effect of Six Thinking Hats strategy on Lateral thinking of high school students.
3. There is no significant effect of Six Thinking Hats strategy on General Creativity of high school students.
4. There is no significant effect of Six Thinking Hats strategy on Argumentativeness of high school students.

8.3.5 Delimitations of the study

The study has its delimitations with respect to title, sample selected, experimentation process and treatment applied. Apart from this, other delimitations of the study were:

1. The study is limited to only one strategy i.e. Six Thinking Hats whereas there could be some other effective strategies also.
2. The sample was selected from a Government Boys Senior Secondary school located in an urban area.
3. The home environment of the students was not included in the study.
4. The other variables like watching television and extra study materials available through any other source that may have affected the thinking process have not been accounted for.
5. Various extraneous variables might have affected the results. The variables that the researcher could not think of, or the variables which were beyond the control of the researcher, have not been included in the study.
6. The study is also limited to teacher variable. Teachers of varying aptitude, with different culture, ideologies and background, teaching the students have not been taken care of. This variable has neither be controlled nor matched for different groups of students.

8.4.0 Method and Procedure

The study was undertaken to find out the effects of Six Thinking Hats strategy on development of parallel thinking, lateral thinking, general creativity and argumentativeness of high school students. For this, specific method and procedure was followed. Details of the same have been given under the captions: Research Design Sample, Tools Used, Treatment Employed, Identification of Variables, Experimental Controls Used, Procedure of Experimentation, Data Collection and Statistical Analysis.
8.4.1 Research Design

In order to study the effectiveness of six thinking hats strategy on development of parallel thinking, lateral thinking, general creativity and argumentativeness of high school students, Nesting-cum-Crossing design was followed. The present experimental study used Pre-Test, Post-Test, Control Group Design. The experiment resembled three-way factorial (2X3X2) nesting-cum-crossing design. In order to see the effectiveness of the strategy, data was analyzed quantitatively.

8.4.2 Sample

In the present study, one Govt. Boys Sr. Sec. School was selected from the Nanglooi District. Out of 452 students of IX Class, 160 students were selected randomly. The students were tested on socio-economic status scale and the scores proposed that majority of students belonged to the same i.e. average to below socio-economic status. Now the sample students were administered the Raven’s Progressive matrices. On the basis of mean and standard deviation, these students were further divided in three parallel groups; high intelligent, middle intelligent and low intelligent. In the study, initially 40 students were chosen randomly from each category of intelligence, making for 120 students in total. These students were further divided into two groups randomly in such a way that there were 20 students of each intelligence level in all the categories. For the analysis 16 students from each category were retained, making for 96 students in all, for the fear of sample death.

8.4.3. Tools Used

The study employed two types of tools i.e. treatment tools and measuring tools.

1. Treatment Tools

These were the tools which were used to impart instructions to the students. The instructions varied in two ways viz., Six Thinking Hats and Conventional method. For these instructional variations, tools consisted of lesson plans, lesson plan formats and worksheets which were prepared according to assumptions and objectives of the instructional procedure.
2. Measuring Tools

These were employed to measure changes in parallel thinking, lateral thinking, general creativity and argumentativeness of high school students.

1. Parallel Thinking test developed and standardized by investigator herself.

2. Lateral Thinking test developed and standardized by Sucheta and Aggarwal(2012).

3. General Creativity test developed and standardized by Baquer Mehdi.

4. Argumentativeness scale developed and standardized by Infante and Rancer(1982).

5. Raven’s Progressive Matrices developed and standardized by J.C. Raven(1961).

6. Socio-economic status scale developed and standardized by Kalia and Sahu.

a) Parallel Thinking Test

The parallel thinking test was developed to measure parallel thinking of IX class students as well as persons above age twelve. The test permits freedom of responses along with the prescribed direction in each item. The subjects were supposed to write their responses on the blank space provided in the test booklet under each item. There were 24 items in all. The scoring of the parallel thinking test is centered on the given direction. The following steps were followed while developing and standardizing the test.

- Preparation of a preliminary draft
- Standardization of the parallel thinking test

To prepare the first draft, steps like item formulation, item selection and item analysis were followed and ultimately 24 items that followed all the requisite conditions were retained.

**Reliability**- Test-retest reliability coefficient for test was .79 whereas parallel form reliability coefficient was .68.

**Validity**- The ‘face’ validity was employed in selection of items. The content validity was acquired from the judgement of the subject matter
specialists. A panel of experts from the field of thinking found the test thoroughly valid.

b) Lateral Thinking Test

In order to measure the lateral thinking of the students, the lateral thinking test developed and standardized by Sucheta and Aggarwal was employed. This test can be used for all persons above the ages twelve. The test-retest reliability of the test was .74.

c) The Baquer Mehdi Verbal Test of Creative Thinking

In order to measure the general creativity of the students, Baquer Mehdi’s verbal test of creative thinking was used. The test pertain to three factors of creative thinking are fluency, flexibility and originality. This test has a test-retest reliability of the factor scores and also the total scores ranging from .896 to .959.

d) The Infante and Rancer’s Argumentativeness Scale

In the present study, for measuring the argumentativeness of the students, Infante and Rancer’s argumentativeness scale was used. This scale consists two types of approaches namely argumentative approach (10 items) and argumentative avoid (10 items). The reliability co-efficient for each approach was .91 and .86 respectively.

e) The Raven’s Progressive Matrices

For measuring the intelligence of the students, Raven’s Progressive matrices was administered. This test is useful for the persons of all ages from 8 to 65 years. The scale has a test-retest reliability ranging from 0.83 to 0.93 for different age groups. It correlates to the extent of 0.86 with the Terman Merrill scale of intelligence. “
f) Socio-economic status scale

A socio-economic status scale (Urban) developed and standardized by Kalia and Sahu was used to check the socio-economic status of the students. The test divided into five parts and consisted of 40 items. The scores could be further categorized into three categories ranging from low (44 or below), middle (45 to 77) and high (78 and above). The scale was found to be sufficiently valid.

8.4.4 Treatment employed

There were two different groups of students who were given two different kinds of treatments that lasted for two months. One was called experimental group and the other was control group. The students of experimental group were taught through Six Thinking Hats strategy. This group was designated as (A1) group. The students of second group were taught through expositional method termed as control group and was designated as (A2). The subject matter for both the groups was similar.

8.4.5 Identification of variables

In the present study, three types of variables were undertaken. These variables were independent variables, dependent variables and intervening variables.

Independent variables were manipulated to see their effect on the parallel thinking, lateral thinking, general creativity and argumentativeness of high school students. These included: Two treatment groups; (Six Thinking Hats and Conventional Method), Three level of intelligence; (high, middle and low) and two testing occasions; (pre-test and post-test).

Dependent variables were those which acted as criterion to test the effect of different independent variables. These were the scores of parallel thinking test, lateral thinking test, general creativity test and argumentativeness test of students.

Intervening variables were those that could not be measured directly but had their effect on the outcomes of treatment. Before conducting the experiment, it was considered necessary to identify and control all the variables that can affect the dependent variables. These variables were: socio-economic status, grade level, existing abilities, teacher behavior, sex of the students, school variable, physical
environment of the classroom, contamination effect and study habits etc. All these variables were either controlled experimentally, statistically or equalized by the ways of controlling them.

8.4.6 Experimental Control Used

Every possible attempt was made to control those factors, which could create bias. In order to control the inter-group variation in different treatment groups, the researcher herself provided treatment to both the groups. The investigator tried to maintain the sympathetic and encouraging attitude towards both the groups in order to have a constant socio-cultural climate during the experimentation. Every effort was made to maintain the experimental conditions similar in both the experimental groups. The experimental process was controlled by keeping experimental situation, classroom environment, duration of experiment and mode of testing same for all the treatment groups. The students who were irregular or non-serious in any of the teaching groups were kept out of sample.

8.4.7 Procedure for Experimentation

The procedure of this study involved selection of students for treatment groups and experimentation which is shown through figure 8.1
Experiment was conducted in three phases. In the first phase the students of each group was administered the Raven’s Progressive Matrices, Socio-economic status scale, Parallel Thinking test, Lateral Thinking test, General Creativity test and Argumentativeness test. After this the students were provided orientation and instruction about the treatments. In the second phase the variables were identified and controlled. This study pursued three types of variables. These variables were: Independent variables, Dependent variables and Intervening variables. The third phase was the evaluative phase. In this phase, students were evaluated for outcomes
of the treatment on the basis of scores on parallel thinking test, lateral thinking test, general creativity test and argumentativeness test.

8.4.8 Data Collection

In this study, the data were collected keeping in view the objectives of the study. In order to study the effectiveness of six thinking hats strategy, the data was collected at two occasions. One was pre-test occasion called as occasion-I. Before conducting the experiment, the students of IX Class were pre-tested on parallel thinking test, lateral thinking test, general creativity test and argumentativeness test, the scores of which were termed as pre-test scores. Immediately after the treatment, the students were tested again on the same tests, the scores of which were termed as post-test scores. This was post-test occasion termed as occasion-II.

8.4.9 Statistical Techniques Used

1. The measures of central tendency and the measures of dispersion such as mean and standard deviations were worked out to know the nature of the data.

2. Multivariate analysis was used to assess the data in order to find out the effect of different groups (i.e. experimental and control), levels of intelligence and testing occasions on parallel thinking, lateral thinking, general creativity and argumentativeness. Parallel thinking tests, lateral thinking tests, general creativity tests and argumentativeness tests were employed and three way analysis of variance (2X3X2) factorial design were used.

Whenever F-ratio was significant, it was interpreted by calculating the mean scores and t-test and the results of instructional effects were supported by plotting the graphs.

8.5.0 Findings

The study was conducted to measure the effect of six thinking hats strategy on parallel thinking, lateral thinking, general creativity and argumentativeness of high school students. The analyses of data made by three-way ANOVA, further interpreted by mean scores and t-test led to the following findings in the study with respect to the effectiveness of the Six thinking hats strategy. The results were reported for simple
effects as well as interactional effects. Some of the salient findings emerged from the experiment are discussed below:

a) Effect of Six Thinking Hats strategy on Parallel thinking of High School Students:

1. Students of experimental group achieved much higher mean scores than the student of control group. Thus Six Thinking Hats strategy affected improvement in parallel thinking of high school students.
2. Intelligence also affected improvement in parallel thinking scores. High intelligent students achieved much higher scores than middle and low intelligent students.
3. The students achieved higher mean scores at post-test than at pre-test showing that the parallel thinking increased after the treatment i.e. post-test.
4. The students belonging to experimental group achieved the highest mean scores on the post-test after the experiment. It indicated that the Six Thinking Hats strategy is helpful in developing parallel thinking of the high school students.
5. The high intelligent students of experimental group achieved the higher mean scores on the post-test than their counterparts in control group on parallel thinking test scores. So the Six Thinking Hats strategy was better than Conventional method in developing parallel thinking of high school students.

b) Effect of Six thinking Hats strategy on Lateral thinking of High School Students:

1. The students of experimental group achieved much higher mean scores than the students of control group. So, Six Thinking Hats strategy was most helpful in enhancing the lateral thinking of the high school students.
2. The students of high intelligent groups achieved slightly higher mean scores at lateral thinking test than their counter parts with medium or low intelligent students. It shows that the intelligence affected the results on lateral thinking test significantly.
3. The students achieved higher mean scores at post-test showing that the lateral thinking ability increased after the treatment i.e. post-test.

4. There was a significant difference among students of different levels of intelligence when they were pre-tested and post-tested indicating that the Six Thinking Hats strategy was more effective in improving lateral thinking scores of the high intelligent students in comparison to middle or low intelligent students.

5. The experimental group achieved the higher mean score on the post-test than their counterparts in control group on lateral thinking indicating that the Six Thinking Hats strategy was helpful in developing lateral thinking of high school students.

c) Effect of Six thinking Hats strategy on General Creativity of High School Students:

1. The students of experimental group achieved much higher mean scores than the students of control group and the creative ability was much higher in experimental group. So the Six Thinking Hats strategy was very much effective in development of general creativity of high school students.

2. Intelligence was also found to affect the result on general creativity test. The high intelligent students achieved slightly higher mean scores at general creativity test than their counterparts with medium or low intelligent students.

3. The students achieved higher mean scores at post-test than at pre-test showing that the creative thinking ability increased after the treatment i.e. post-test.

4. The significant differences existed among students of experimental and control groups when they were pre-tested and post-tested. The experimental group achieved the higher mean score on the post-test than the control group on general creativity test. So it was clear that the Six Thinking Hats strategy was helpful in enhancing creative ability of high school students.

5. There was a significant difference among students of different levels of intelligence when they were pre-tested and post-tested indicating that Six Thinking Hats strategy was more effective in improving creative thinking ability of the high intelligent students in comparison to middle or low intelligent students.
d) Effect of Six thinking Hats strategy on Argumentativeness of High School Students:

1. The argumentation level was higher in experimental group. The students of experimental group achieved higher mean scores on argumentativeness test than the students of control group. So the Six Thinking Hats strategy was more effective in improving argumentation level of the high school students.

2. The students achieved higher mean scores for argumentativeness on post-test than pre-test i.e., after the experimentation So the Six Thinking Hats strategy was effective in developing argumentativeness.

3. The experimental group achieved higher mean score on the post-test than their counterparts in control group on argumentativeness. So it was clear that the Six Thinking Hats strategy was more helpful in stimulating argumentativeness of the students than the Conventional method.

8.6.0 Educational Implications:-

The findings of the study are very much clear that parallel thinking and lateral thinking are enhanced when students are exposed to Six Thinking Hats strategy. Not only on the parallel and lateral thinking, it proved its effectiveness on general creativity and argumentativeness level. It further asserted that the thinking skills are trainable. The study paves a way for more of such studies that include strategies for the training in thinking skills. The findings have their implications for students, teachers, student-teachers, parents, administrators, teacher-educators, policy makers and even the curriculum planners.

8.11.0 Suggestions

The present study has been directed towards studying the effectiveness of Six Thinking Strategy on development of parallel thinking, lateral thinking and general creativity in high school students. It has its own limitations and delimitations.
Therefore, it is desired that similar studies may be conducted after overcoming the limitations. Further, the experimental studies, like this, need to be repeated and done in a different cultural setting so as to test the reliability and validity of the findings and arrive at generalization. However, a few suggestions regarding further research possibilities in the field have been put forward under:-

1. A similar study for effectiveness of the Six Thinking Hats strategy can be conducted for the students of senior secondary and higher education system.
2. A similar study for effectiveness of the Six Thinking Hats strategy can be conducted on management students, teachers and professionals.
3. A comparative study for effectiveness of the Six Thinking Hats strategy can be conducted for students from government and private schools.
4. A comparative study for effectiveness of the Six Thinking Hats strategy for male and female students may be conducted.
5. A similar experimental study may also be undertaken to explore the attitude of the students and teachers towards the Six Thinking Hats strategy.
6. Similar studies may be undertaken for students belonging to different socio-economic status.
7. Researchers may take up studies with a view to comparing other instructional methods with Six thinking Hats strategy. Micro level studies may help teachers to find a method of teaching that can develop parallel, lateral and creative thinking.
8. Studies at micro level going for content analysis of the worksheets, students responses and analogical etc. needs to be conducted so as to find out those convenient situations where parallel, creative and lateral thinking at its maximum.
9. Researches may be conducted component wise, area wise of parallel thinking and lateral thinking.

The investigator concluded the study with the hope that the findings would help in improving parallel thinking, lateral thinking and general creativity of high school students to a great extent. It is also hoped that the studies suggested elsewhere would be carried out by others.