

CHAPTER FIVE  
DISCUSSION

## CHAPTER V

### DISCUSSION

#### 5.1.0 Introduction

The present study has attempted to find out the effectiveness of the Creative Teaching Method upon the general creative thinking, creative thinking in geography, and achievement in geography of the eighth graders. The rationale for undertaking this study was discussed in chapter I. The details regarding the pilot study, method and procedure adopted in this study were given in chapter II. The construction and standardisation of the Geography Achievement Test on Structure of Intellect Model and the development of three achievement tests, such as, Achievement Test I in Geography, Achievement Test II in Geography and Achievement Test III in Geography were described in chapter III. The collection of data and analysis of the results of the experiment were presented in chapter IV. In the present chapter, the results are discussed according to the hypotheses.

It may be stated here that there were eight hypotheses to be tested in this study. The first hypothesis was related to general creative thinking. Hypotheses II to VII were related to the creative thinking in geography. The last hypothesis was related to the achievement in geography. The presentation of the discussion will be in a particular order viz., the discussion for the general creative thinking

will be made under caption 5.2.0, creative thinking in geography will be made under caption 5.3.0 and the achievement in geography will be under caption 5.4.0. Before starting the discussion, the relevant hypothesis has been stated under each caption for the convenience of the reader. The conclusions drawn from the discussion have been reported in the last paragraph of each caption

#### 5.2.0 Discussion of Results Relating to General Creative Thinking

Hypothesis I. There is no significant difference in general creative thinking between the group taught through the Creative Teaching Method and the group taught through traditional method.

The effect of teaching of geography through the Creative Teaching Method upon the general creative thinking of eighth graders was analysed by employing the techniques of analysis of covariance, having the three covariates of SES, intelligence and general creative thinking. The F-ratio was not significant. ( $F=2.532$ ,  $df=1/69$ , vide Table 4.1). This implies that the general creative thinking of the experimental group and that of control group students did not differ significantly. Thus, the hypothesis I as stated above is not rejected.

In the related literature, there could not be seen a similar study of the present type. But the findings of the following studies can be examined in the context of the present results. Frantz (1975) selected Brainstorming, Synectics, and Physiognomic response training for investigating their effect upon creative thinking of fifth grade pupils. It was found that the Brainstorming instruction was the least effective of the three groups. Brandt's (1974) experiment also demonstrated that there were no significant treatment effect of group counselling creativity training on creativity, adjustment and achievement of fifth grade children. Silvestro (1974) investigated the differential effects of training with convergent and Brainstorming thinking tasks on the conceptual tempo of impulsive and reflective third grade children. He found out from the study that training with convergent tasks have significantly increased the Matching Familiar Figures Test's (MFF) time scores of impulsive students. Stern (1973) reported that the treatment of watching of special television programmes like cartoons, sports, comedies, drama, etc., were not effective for the development of creative thinking among mentally gifted minors. Instead the scores of control group showed an increase in creative ability when post test scores were compared to the pretest scores. Taylor et al.'s (1957) research project at Yale University indicated Brainstorming as a means of group ideation was inferior to individual thinking.

*Irrelevant*

The results of the following studies did not agree with the present finding. Meadow, Parnes and Reese (1959) reported that with Brainstorming the production of good answers was a little more than doubled. Parnes (1962) reported a study in which more than 1200 students participated, revealed that the creative problem solving students showed substantial gains in quantity of ideas on two tests of idea quantity repeated at the end of the course. In this study Brainstorming, check-lists and forced relations were the methods to train the experimental students. Torrance (1965) observed that pupils permitted to practice without teacher evaluation were able to perform more creatively on subsequent occasions than were pupils who had practised with teacher evaluation. Turner, Winston and Rains (1965) tested 30 high and 29 low creative subjects for the effects of Brainstorming upon idea production. They found positive effects of the Brainstorming instruction between the two groups. Hutchinson (1967) found significant effect of the modified instructional method (Brainstorming) upon the experimental group in total productive thinking. Alencar (1974) studied the effect of Purdue Creative Thinking Programme. In the experimental conditions after the reading of a story about a famous American Pioneer by the teacher the pupils worked on some creativity exercises. The conclusions drawn were that the programme had a positive effect of Divergent Production Instruction on ninth grade English students were significant in two of the three subtests and the composite test results of 'verbal creativity'.

This diversity of findings provided curiosity to probe further into the data. For this purpose, the effect of the treatment upon the general creative thinking and its subparts, such as, Seeing Problems, Unusual Uses, and Consequences, between the t-values were found out. The t-values were not found significant, (vide Table 4.2) This reflects that there is no significant difference between both the groups after the treatment. Hence it is found that the effect of the treatment was almost similar as to that of traditional method.

The findings of no difference between the experimental and the control group for the criterion variable of general creative thinking can be attributed to the following arguments.

One of the arguments may be that the duration of the treatment was too short to have differential effect on the development of creative thinking. In this regard, a few studies may be quoted to examine the experimental treatment. Frantz (1975) had 10 sessions of 30 minutes each for his study. Weinstein (1975) had a series of five, one hour elaboration skill training session, administered at approximately at one week interval. Payne (1973) for his experiment had one session, Callahan (1973) eight weeks, Parnes (1962) had five short courses. From the perusal of the above studies, it can be said that the duration of the present experiment is sufficient for the purpose of the study.

Another point that may be raised is the mixture of the two techniques of Morphological analysis and Brainstorming. It may be argued that these two techniques mutually interact with each other resulting in the lesser effectiveness upon the students' creative thinking. As discussed under caption 1.6.2 many studies, such Turner et al., (1965), Huchinson (1967), Fleming (1972), Frantz (1975), etc., have been conducted using the Brainstorming as their treatment variable. Morphological analysis is a creative technique mainly used in engineering. Both the techniques aim at bringing new idea combinations. The basic principles of both the methods were presented under caption 1.6.1 and 1.6.2. From that it is seen that the basic theories of these two techniques do not oppose each other. These techniques are perhaps complementary between them, not contradictory. These two methods were introduced simultaneously, for the main reasons of flexibility of approach, and relevance of the Creative Teaching Method to the subject matter. In fact the students and the investigator found it interesting when these approaches, that is Morphological analysis, Brainstorming and traditional way of teaching were integrated to form the treatment of the experiment.

Another point that can be putforward is that the time needed for teaching the topics by the techniques of Morphological analysis and Brainstorming was perhaps not equated

since normally these methods may require more time. But this observation does not hold good, since, the investigator had planned to equate time and teaching within the experimental and control groups. It is true that the schools were conscious of finishing the monthly courses within the scheduled time . They do not bother much about the methods and way of teaching, instead they care more for the required portions covered within the prescribed time limit. The investigator felt it at certain times when he was instructed to hurry up the teaching when he wanted to proceed a little slowly in order that the students may adjust to the new methods. But it is to be remarked that there was no difficulty to this investigator in this respect, because he prepared the lesson plans sufficiently earlier and preplanned every-thing in such a manner that there was no delay in the preparation or execution of lessons. One of the objectives of the study, as said earlier was to find out the effect of the treatment variable in the normal working conditions of the school, and for the regular teaching of the subjects. Therefore the question on hand did not arise in this study.

It may be noticed that the experimental treatment was given only for two periods per week. The other school environment remained the same. It may perhaps be influential over the treatment given by the investigator. Another logical

*How did  
students  
react?  
Did  
conflict?*



reason can be that the teaching of other subjects by other teachers was done through the traditional method. Perhaps directly or indirectly, the other teachers were undoing what the investigator was doing, during the experiment.

From the perusal of the related literature, it will be seen that only a few studies have taken samples from school students to see the effect of the creativity techniques. Many of them deal with adults placed in other types of settings. The main purpose of many of the studies was to introduce the different techniques as creativity development methods and not as teaching methods. In this context, it can be stated that a maiden attempt was made in this study 'to teach the content of geography through the Creative Teaching Method. The examination of the findings only supports Parne's (1962) statement that the study of creativity is still immature to say exactly what happens in a person who studies and practices the principles of creative thinking.

From the above discussion, the following conclusions can be derived.

- 1) The treatment of Creative Teaching Method in geography when compared with the traditional method did not produce differential effect upon general creative thinking of eighth graders.
- (2) The treatment of Creative Teaching Method in geography when compared with the traditional method did not produce differential effect upon the subparts of general creative thinking such as, Seeing Problems, Unusual uses, and Consequences.

### 5.3.0 Creative Thinking in Geography

As discussed under caption 5.1.0 there were six hypotheses to be tested under creative thinking in geography. Therefore, starting from the discussion of hypothesis - II, which deals with cognition abilities in geography, followed by the discussion of the hypotheses relating to memory, divergent production, convergent production, evaluation and the total creative thinking in geography will be made under caption 5.3.1 to 5.3.6 respectively.

#### 5.3.1 Discussion of Results Relating to Cognition Abilities in Geography (CMP)

Hypothesis - II There is no significant difference in cognition abilities in geography between the group taught through the Creative Teaching Method and the group taught through the traditional method.

The effect of teaching of geography through the Creative Teaching Method upon the cognition abilities in geography of eighth graders was analysed by employing analysis of covariance technique having three covariates of SES, intelligence and general creative thinking (CYPT). The F-ratio was not significant. ( $F = 0.12$ ,  $df = 1/69$ , vide Table 4.3). This implies that the treatment has not produced differential effects upon cognition abilities in geography

of eighth graders when compared with the traditional method. Therefore the hypothesis II as stated above is not rejected.

Guilford and Hoepfner (1971) included cognition, memory, divergent production, convergent production and evaluation as required abilities in this model of SI. Cognition means discovery, rediscovery or recognition (Guilford 1957). This cognition consists of the mental abilities of verbal comprehension, verbal classification, verbal analogies, general reasoning, penetration, and conceptual foresight. (vide Table 3.2 ). These mental abilities are known respectively as cognition of semantic unit (CMU), cognition of semantic class (CMC) cognition of semantic relation (CMR), cognition of semantic system (CMS), cognition of semantic transformation (CMT), and cognition of semantic implication (CMI).

To examine closely and to find out the effect of the treatment upon these six mental abilities, t-test was applied between the mean scores of the six mental abilities of cognition in geography of the two groups. It was found from the results that only the t-values for two mental abilities of verbal comprehension (Cognition of semantic unit) and verbal analogies (Cognition of semantic relation) were significant at 0.01 level in favour of experimental group ( $t = 3.85$  and  $2.65$  respectively, vide Table 4.4). It implies that the mental abilities of only the verbal comprehension

and verbal analogies under the cognition abilities in geography developed significantly among the experimental students because of the treatment.

From the above the following conclusions may be derived :

(1) The Creative Teaching Method did not produce differential effects upon cognition abilities in geography of eighth graders when compared with the traditional method of teaching geography.

(2) When compared with the traditional method of teaching geography, the Creative Teaching Method developed higher mean scores on the mental abilities of verbal comprehension and verbal analogies.

(3) There were no differential effects for the mental abilities of 'verbal classification, general reasoning, penetration, and conceptual foresight of eighth graders because of the Creative Teaching Method, than the traditional method of teaching geography.

#### 5.3.2 Discussion of Results Relating to Memory in Geography (MMP)

Hypothesis III - There is no significant difference in memory abilities in geography between the group taught through the Creative Teaching Method and the group taught through the traditional method.

The technique of analysis of covariance was employed to analyse the data and to find out the effect of teaching geography through the Creative Teaching Method upon the memory abilities in geography (MMP) of eighth graders; the covariates were of SES, intelligence and general creative thinking. The F-ratio was not significant, ( $F = 1.42$ ,  $df = 1/69$ , vide Table 4.5). This implies that the treatment has not produced differential effects upon the memory abilities in geography of eighth graders than the traditional method. Therefore the hypothesis III as stated above is not rejected.

Memory means retention of what is recognised (Guilford, 1957). This memory consists of the mental abilities of 'memory for ideas, concept recall, finding the relation with definition, learned information, memory for word meaning and memory for paired associates. Technically these abilities are called as memory for semantic unit (MMU), memory for semantic class (MMC), memory for semantic relation (MMR), memory for semantic system (MMS), memory for semantic transformation (MMT), and memory for semantic implication (MMI) respectively. In order to observe closely the effect of the treatment upon these six mental abilities of memory of the two groups, t-test was applied between the mean scores of these six mental abilities of memory of the two groups separately. The results indicated, that only the t-values for memory for semantic transformation (MMT) and memory for

semantic implication (MMI) were significant at 0.05 level, ( $t = 2.06$  and  $2.53$  respectively, vide Table 4.6). The mean scores of MMT of control group is significantly higher than the experimental group whereas, the mean score of MMI of experimental group is significantly higher than that of control group. This conveys that the mental ability of 'memory for word meanings' (MMT) has been developed significantly by the traditional method than the treatment of Creative Teaching Method. But the mental ability 'memory for paired associates' (MMI) received significant gains by the treatment. The above finding related to 'memory for paired associates' (MMI) is agreeable to Weinstein (1975). His ninth grade experimental subjects participated in a series of five one hour elaboration skill training sessions. The subjects were exposed to a set of 20 learning tasks. They were required to create a series of elaborators or mediational aids for each of the tasks. From this study Weinstein found significant mean differences favouring experimental group on the free recall and trial two of the paired associates learning tasks. Thus, it is observed that the traditional method produced significant higher means for the mental ability of memory for word meanings compared to the Creative Teaching Method. But for the ability of 'memory for paired associates, the Creative Teaching Method produced significantly higher mean scores than the traditional method. Similar results were found by Weinstein (1975).

From the above discussion the following conclusions may be derived :

- (1) No differential effects were found upon the memory abilities in geography of eighth graders because of the treatment of Creative Teaching Method than the traditional method of teaching geography.
- (2) The mental ability of 'memory for paired associates' of eighth graders received significant positive effect because of the Creative Teaching Method than the traditional method of teaching geography.
- (3) The traditional method of teaching geography produced higher mean scores on the mental ability of memory for word meanings of eighth graders, than the treatment of teaching through Creative Teaching Method.
- (4) There were no differential effects for the mental abilities of 'memory for ideas, concept recall, finding the relation with definition, and learned information' of eighth graders because of the Creative Teaching Method compared with the traditional method.

### 5.3.3 Discussion of Results Relating to Divergent Production in Geography (DMP)

Hypothesis IV - There is no significant difference in divergent production abilities in geography between the group taught through the Creative Teaching Method and the group

taught through the traditional method.

Analysis of covariance was applied to analyse the data to find out the effect of teaching of geography through Creative Teaching Method upon the divergent production abilities in geography of eighth graders. The covariates were SES, intelligence and general creative thinking. The F-ratio was not significant ( $F = 1.98$ ,  $df = 1/69$ , vide Table 4.7). It reflects that the Creative Teaching Method did not produce differential effects upon the divergent production abilities in geography of eighth graders as compared to the traditional method. Therefore the hypothesis as stated above is not rejected.

The above finding is not in line with the findings of Hutchinson (1967) who conducted a fifteen day study of modified instructional methods (Brain storming) which treated social studies students as thinkers. The results indicated that the modified instructional method produced distinct change in the ratio of verbal response categories. A sharp increase in the total productive thinking was noticed. It may be stated here that productive thinking may be of two types, such as, (i) divergent production and (ii) convergent production. The discussion about the convergent production will be presented under caption 5.2.4. Induced by these contradictory findings, the investigator wanted to find out the effect of the treatment



upon the sub components of this operation. Under divergent production there are six mental abilities such as 'ideational fluency, spontaneous flexibility, associational fluency, expressional fluency, originality, and elaboration'. These abilities are represented respectively by divergent production of semantic unit (DMU), divergent production of semantic class (DMC), divergent production of semantic relation (DMR), divergent production of semantic system (DMS), divergent production of semantic transformation (DMT), and divergent production of semantic implication (DMI). The means scores of these mental abilities in geography were compared by applying t-test for the control and experimental groups separately. The results indicated that the t-value for the mental ability of elaboration ( Divergent production of semantic implication) is significant at 0.01 level, (vide Table 4.8). The t-values for the other mental abilities of divergent production such as ideational fluency, spontaneous flexibility, associational fluency and originality were not significant. The mean score of elaboration of experimental group is significantly higher than control group. It means, the mental ability of elaboration in geography of eighth graders is affected significantly by the treatment. Guilford (1966) says that elaboration is one variety of original production. Compared to the other mental abilities in this operation, only elaboration was

found to be developed significantly through this Creative Teaching Method. Some of the other findings which can be compared with the present one are discussed in the following paragraphs.

Wilson's findings did not support to the present one. Wilson (1972) studied the effect of 40 hours of creativity training given under the two different modes of training upon the prospective teachers and pupils' fluent, flexible, original and elaborate thinking. One mode of creativity training given to the prospective teachers was with direct involvement in exercises designed to enhance creativity. The other was with discussion, but no direct involvement. The results revealed, that the pupils improved in fluency, flexibility and originality and they declined in elaboration. Alencar (1974) studied the effects of the Purdue Creative Thinking Programme on fourth and fifth grade public and private school pupils' creative thinking abilities. He found significant gains in originality, figural fluency, and flexibility.

In this connection it is fit to quote the study of Abkemeier (1975), even though in his study, semantic modes were not included. Abkemeier conducted a study to investigate the relationship between structure of intellect-figural and

symbolic attitudes and three personological variables (sex difference, mathematical modality preference, and problem solving strategy) with the figural and symbolic modes of presenting mathematical concepts. Subjects were 160 Algebra II students of two catholic high schools. The concept of the function was presented in two printed instructional programmes. One employed a figural mode presentation, the other a symbolic mode. Besides others, the results indicated in particular that the measure for the aptitude 'divergent production of figural systems' was the most important measure in the total set of aptitude measures and was, by itself significantly related to dependent measures in all groups.

Carey (1975) found significant effect of the treatment only in verbal flexibility in favour of experimental group. He investigated the effect that training in thinking skills had on the academic achievement of fifth and sixth grade students in reading and arithmetic. Besides the results on achievement, the study revealed significant effect only in verbal flexibility.

Lloyd's (1975) attempt also demonstrated similar but more favourable findings as regards to divergent production. His sample of ninth graders were given the treatment of instruction on divergent production of semantic content factors of units, classes, relations, systems, transformations and

implications. The results revealed that there were significant effects upon three out of the five tests of divergent thinking favouring the experimental group. The present finding of this study is in favour of the findings of the study by Torrance (1964) also. He found that unevaluated practice tends to produce greater elaboration in children except at sixth grade level. But it did not agree with Torrance's finding that originality could be developed by unevaluated practices.

Seymour's (1975) finding is to a limited extent, in favour of the present finding. Seymour investigated teacher's ability to justify creative children as well as difference in creativity in the two SES cultures. He found that the higher the SES score the higher will be the creativity in only one of the 10 creativity measures, that is in 'figural elaboration'. In the present study it is semantic elaboration which is significant for both low and high creative students.

Anram and Giese (1965) conducted three studies and the results indicated that the students could gain in originality. Davis and Manske (1966) found the same results. They found that situations instructions for the experimental group significantly increased originality of the college students.

From the above, it is seen that the studies of Wilson (1972), Carey (1975), Anram and Giese (1965), Davis and Manske (1966), etc., found their treatment increased the mental abilities of flexibility and originality. Hutchinson's study (1967) found the

increase of productive thinking as a whole. But the results of the present study did not find differential effects upon the above abilities. But it found the increase of the mental ability of semantic 'elaboration' for the experimental group as a whole whereas, Seymour (1975) found his treatment increased figural elaboration for high SES groups. Contrary to the present findings Wilson's (1972) study revealed the decline of this mental ability of elaboration. Viewing these contradictory findings it is safe to say that no final conclusion can be made because of lack of adequate research support.

The following conclusions can be derived for the present study from the above discussion :

- (1) The treatment of Creative Teaching Method in geography did not produce differential effects upon divergent production abilities in geography of eighth graders, when compared with the traditional method.
- (2) The mental ability of 'elaboration' of eighth graders received significant effect by the Creative Teaching Method than the traditional method of teaching geography.
- (3) The treatment of Creative Teaching Method in geography did not produce differential effects upon 'ideational fluency, spontaneous flexibility, associational fluency, expressional fluency, and originality' of eighth graders, when compared with the traditional method.

#### 5.3.4 Discussion of Results Relating to Convergent Production in Geography (NMP)

Hypothesis V - There is no significant difference in convergent production abilities in geography between the group taught through the Creative Teaching Method and the group taught through the traditional method.

The effect of teaching geography through the Creative Teaching Method upon the convergent production of eighth graders was analysed by employing analysis of covariance technique, where the covariates were SES, intelligence and general creative thinking. The F-ratio was significant at 0.05 level. ( $F = 4.19$ ,  $df = 1/69$ , vide Table 4.9). The adjusted mean score of students of the experimental group for convergent production in geography is significantly higher than that of the control group. This implies that convergent production abilities in geography of eighth graders had improved significantly by the Creative Teaching Method. Hence the hypothesis as stated above is rejected.

Silvestro (1974) investigated the differential effects of training with convergent and Brainstorming thinking on the conceptual tempo of impulsive and reflective third grade children. His finding was that training with convergent tasks significantly increased the Matching Familiar Figures Test's time scales of impulsive students. The results of the present

study indicate that training increased convergent tasks, whereas Silvestro found training with convergent tasks, significantly increased the criterion score. Hutchinson's (1967) study, as pointed out earlier under the discussion of divergent production, demonstrated significant increase in total productive thinking. It includes both divergent production and convergent production. Klausmeier (1964) says that 'reasoning' is similar to convergent thinking, if not identical process. Convergent production is the ability that leads to one right answer or to a recognised best or conventional answers. Regarding the importance of convergent production, Guilford (1967) says that it is the area of logical deductions or at least the area of completing inferences. Convergent production rather than divergent production is the prevailing function when the input information is sufficient to determine a unique answer. This ability is different from divergent production. Divergent production is taking different ways to find out the answers. But for both Guilford (1957) and Klausmeier (1964) these two productions are complementary and form part of total productive thinking. Finding out the right answer is common in both the abilities. Guilford (1966) incorporated both divergent and convergent thinking as well as cognition memory, and evaluation as the required abilities in creativity in all fields. He further stated that the specific

abilities related to convergent and divergent thinking might be different for artists and scientists. On these lines it can also be said that the abilities related to convergent thinking in geography might also be different.

This convergent production consists of six mental abilities, viz., 'location of central idea, ability to see classes, education of conceptual correlates, ordering, semantic, redefinition, and attribute listing. They are respectively known as convergent production of semantic unit (NMU), convergent production of semantic class (NMC), convergent production of semantic relation (NMR), convergent production of semantic system (NMS), convergent production of semantic transformation (NMT), and convergent production of semantic implication (NMI). The effect of the treatment on these abilities separately for the control and experimental groups was studied. To achieve this, comparison was made between the mean scores of the six mental abilities separately, for convergent production in geography between the two groups by applying t-test. The t-values for the mental abilities, namely, convergent production of semantic unit, and convergent production of semantic class, were significant at 0.05 level, (vide Table 4.10). The t-values for the remaining four mental abilities were found to be insignificant. The mean scores of the above two abilities of for convergent production in geography were significantly higher for the experimental group



than the control group. This means that only the mental abilities of 'location of central idea' (NMU) and 'ability to see class' (NMC) received significant gains through the Creative Teaching Method in eighth graders. For other mental abilities, no differential effects were found because of the treatment.

Thus, it is found that the present study indicated increased convergent production because of the treatment of the Creative Teaching Method. Though the treatment and samples were different, the studies of Hutchinson and Silvestro revealed similar results.

The above discussion leads to the derivation of the following conclusions for the present study :

- (1) The convergent production abilities in geography of eighth graders improved significantly by the Creative Teaching Method than the traditional method of teaching geography.
- (2) The Creative Teaching Method in geography produced significant mean scores on the mental abilities of 'location of central idea and ability to see classes' of eighth graders than the traditional method.
- (3) No differential effects were found for the mental abilities of 'education of conceptual correlates, ordering, semantic redefinition, and attribute listing of eighth graders, because

of the treatment of Creative Teaching Method, when compared with the traditional method of teaching geography.

#### 5.3.5 Discussion of Results Relating to Evaluation in Geography (EMP)

Hypothesis VI - There is no significant difference in evaluation abilities in geography between the group taught through the Creative Teaching Method and the group taught through the traditional method.

The technique of analysis of covariance was employed to analyse the data to find out the effect of teaching of geography through the Creative Teaching Method upon the evaluation abilities in geography of eighth graders; the three covariates were SES, intelligence, and general creative thinking. The F-ratio was not significant. ( $F = 0.23$ ,  $df = 1/69$ , vide Table 4.11). This implies that the treatment did not have differential effects upon the evaluation abilities of eighth graders when compared with the traditional method of teaching geography. Therefore the hypothesis VI as stated above is not rejected.

Like the other operations, this operation also consists of six mental abilities, such as, 'class specification from the list of possible answers, class idea to be evaluated, logical evaluation, experimental evaluation, production of answers involving the interpretation of common objects and

sensitivity to problems. The names for these abilities according to structure of intellect model are evaluation of semantic unit (EMU), evaluation of semantic class (EMC), evaluation of semantic relation (EMR), evaluation of semantic system (EMS), evaluation of semantic transformation (EMT), and evaluation of semantic implication (EMI) respectively. In order to observe the effect of the treatment upon these mental abilities, as has been done in the other operations, t -test was applied separately between the mean scores of the said mental abilities in geography for both the groups. The t-value for the mental ability 'logical evaluation' was found to be significant at 0.05 level, (t-value is 2.38, vide Table 4.12). The mean scores of the experimental group is significantly higher than the control group. It implies that the ability of logical evaluation in geography of eighth graders developed significantly by the treatment.

In this regard, it may be presumed that the significant effect upon the mental ability of 'logical evaluation' may be due to the special attention given in the 'red session' of the Brainstorming lessons. According to the principles of Brainstorming, during the 'green session' all ideas irrespective of their merits are accepted. No evaluation is attempted during this session. Only in the red session the given ideas or suggestions are taken up one by one and their worth is determined after logically evaluating the pros and cons of each idea. The

present finding of the development of 'logical evaluation' in the students may be a direct impact of the Brainstorming lessons.

The t-values for the other mental abilities under this operation such as 'class specification from the list of possible answers, class idea to be evaluated, experimental evaluation, production of answers involving the interpretation of common objects, and sensitivity to problems' are not significant.

The present finding is not agreeable to Torrance (1965) and Rusch et al. (1967). Torrance found that unevaluative practice tends to produce greater sensitivity than evaluated practice. Rusch et al conducted an experiment in which six classes of sixth grade students participated. Four of them acted as experimental group and two as control group. The experimental class rooms were characterised as follows. Teachers and pupils planned and evaluated together, teachers encouraged different kinds of thinking. Children were encouraged to experiment. There was an absence of teacher made rules. Motivation was predominantly positive. The classes were pre and post tested. On the following four aspects of creativity such as, sensitivity, originality, fluency and redefinition. They were also tested on five measures of achievement such as Reading Vocabulary, Reading Composition, Language, Work study skills and Arithmetic. They found that the experimental group

was significantly superior in 'sensitivity' than the control group. This disagreement of the present finding may be due to the differences in the treatment variable.

It is seen that the finding of the positive increase of the mental ability of 'sensitivity' by Torrance (1965) and Rusch et al. (1967) is not supported by the results of the present study. But in the present investigation, it is noticed that the mental ability of logical evaluation received significant effect because of the treatment.

The conclusions derived from the discussion are :

- (1) When compared with the traditional method of teaching geography, the Creative Teaching Method did not produce differential effects upon the evaluation abilities in geography of eighth graders.
- (2) The Creative Teaching Method developed the mental ability of 'logical evaluation significantly higher, upon the eighth graders than the traditional method of teaching geography.
- (3) The treatment of Creative Teaching Method did not produce differential effects upon the mental abilities of class specification from the list of possible answers, class idea to be evaluated, experimental evaluation, production of answers involving the interpretation of common objects and sensitivity to problems of eighth graders when compared with the traditional method of teaching geography.

### 5.3.6 Discussion of Results Relating to Creative Thinking in Geography (GATSI)

Hypothesis VII - There is no significant difference in creative thinking in geography between the group taught through the Creative Teaching Method and the group taught through the traditional method.

The effect of teaching geography through the Creative Teaching Method upon the creative thinking in geography of eighth graders was analysed by employing analysis of covariance technique, where the covariates were SES, intelligence and general creative thinking. The F-ratio was not significant, ( $F = 2.40$ ,  $df = 1/69$ , vide Table 4.13). This conveys that Creative Teaching Method did not produce any differential effect upon creative thinking in geography of eighth graders, when compared with the traditional method of teaching geography. Hence the above hypothesis is not rejected.

Under creative thinking in geography there are five operations viz., cognition, memory, divergent production, convergent production and evaluation. The discussion about the results of these five operations have been <sup>made</sup> separately under captions 5.3.1. to 5.3.5. Out of the five analyses of the above five operations, the F-ratio was significant only for the operation of convergent production. When the t-values were found out between the mean scores of these five operations for the control and experimental groups, it was revealed that

t-value was significant only for convergent production (vide Table 4.15).

The mean scores of convergent production in geography for experimental group is significantly higher than the control group. It means that out of the five operation, only convergent production in geography could be significantly differentially developed in eighth graders by the Creative Teaching Method than the traditional teaching method.

As discussed earlier, there are six mental abilities under each operation and in total 30 mental abilities under creative thinking in geography. When t-test was applied for the means of scores of these 30 abilities for the two groups, t-values have been significant at 0.05 level for the mental abilities of 'memory for word meaning, memory for paired association, location of central idea, ability to see classes, and logical evaluation and significant at 0.01 level for the mental abilities of verbal comprehension, verbal analogies and elaboration.

Out of these 8 mental abilities for only one mental ability, that is 'memory for word meaning' the control group had significantly higher scores than that of the experimental group. This implies that for the ability for memory for word meaning (MMT), the traditional method produced higher mean scores than the 'Creative Teaching Method in eighth graders.

The mean scores of the experimental group for the remaining seven above said mental abilities were significantly higher than that of the control group.

Presenting the results productwise, it will be seen that two 'units' have received significant positive effect by the treatment. They are cognition of semantic unit and convergent production of semantic unit. The mental abilities for them were 'verbal comprehension', and 'location of central idea' respectively. The other three units such as 'memory of semantic unit' (MMU), divergent production of semantic unit (DMU), and evaluation of semantic unit (EMU) were having no differential effect due to the treatment.

Under the product of class, the convergent production of semantic class (NMC) was the only ability significantly benefitted by the treatment. The relevant mental ability for NMC is 'ability to see classes'.

Under the third product 'relations' two relations were found to be significantly affected by the treatment. They were cognition of semantic relation (CMR) and evaluation of semantic relations, (EMR). The mental abilities for them respectively were 'verbal analogies' and 'logical evaluation'. The other three relations were not having differential effects because of the Creative Teaching Method as compared to the traditional method of teaching geography.

'Systems' is the only product where the treatment had no differential effect at all. None of the five systems in the



five operations, such as, cognition of semantic system (CMS), memory for semantic system (MMS), divergent production of semantic system (DMS), convergent production of semantic system (NMS) and evaluation of semantic system (EMS) was significantly differing from the control group.

'Memory for semantic transformation' (MMT) is the only ability which significantly differed for the mean scores under the fifth product of 'transformation'. The mean score of this ability for the control group is significantly higher than the experimental group. Hence it is seen that the traditional method has produced higher mean scores than the treatment of Creative Teaching Method in eighth graders. The mental ability of memory for semantic transformation is memory for word meanings. It may be because, the traditional method emphasises more on rote memorization, the ability has been developed significantly higher than through the Creative Teaching Method. The other transformations, such as, cognition of semantic transformation, divergent production of semantic transformation, convergent production of semantic transformation and evaluation of semantic transformation (CMT, DMT, NMT, and EMT) received no differential effects because of the treatment.

When the experimental group and the control group were compared, it was found that the differences between the mean scores of two implications have come out to be significant.

These two 'implications' are 'memory for semantic implication (MMI)' and divergent production of semantic implication (DMI). The mental abilities for them respectively are 'memory for paired associates' and 'elaboration'.

The study has thus demonstrated that seven mental abilities of the creative thinking in geography, viz., two mental abilities from cognition, one from memory, one from divergent production, two from convergent production and one from evaluation, could be developed to a higher level through the treatment of 'Creative Teaching Method' than the traditional method of teaching geography.

Some of the frequently ~~sighted~~ cited mental abilities by other investigators upon which the present findings did not find significant differential effect of the treatment, are general reasoning (CMS), penetration (CMT), ideational fluency (DMU), spontaneous flexibility (DMC), associational fluency (DMR), sensitivity to problems (EMI), etc.

Two factors can be mainly responsible for the present findings which are not in agreement with those of the earlier studies : (i) the treatment, and (ii) the content of geography. Unlike other studies, in the present study, the mental abilities are measured through medium of geography contents and concepts. Out of the four contents of Structure of Intellect Model, namely, figural symbolic, semantic and behavioural, only

semantic contents were included in the test. In order to find out the effect of these two factors further studies should be conducted. But, regarding the treatment, after having acquainted with the literature available on creative thinking, and with the experience of handling the Creative Teaching Method, it can be stated with confidence that the present treatment may be suitable and practicable to the students.

It is also found, out of the experience of the investigator that most of the students have been conditioned to be satisfied with mere academic achievement. They do not want to go beyond the textual knowledge or the knowledge given by the teachers. Somehow or other, this type of attitude has crept into the minds of the students. The mode of examination system may be a basic reason for this type of attitude development. The present test (GATSI) expects the students to go beyond the textual courses of the subject. Considerable number of students purposely avoid<sup>ed</sup> answering the divergent type of questions which are mainly included in the test. This situation will continue so long as the teacher's attitude towards teaching changes from the authoritative level to democratic or creative level.

It may also be stated that this study is a new venture of constructing a test to measure creative thinking in

geography. No similar attempt was found in the related literature. As Osborn (1951) speaks out 'Our main aim is to help education to do more to develop creative ability. Our efforts to this end are threefold : (i) to facilitate establishment of separate courses in creative problem solving, (ii) to encourage incorporation of creative principles and procedures into existing courses, (iii) to help bring about a more creative type of teaching which will combine thinking effort with learning effort, and thus develop thinking ability while imparting knowledge'. The present attempt may be a humble contribution in achieving the third objective given above.

From the above discussion, the following conclusions can be derived.

(1) The treatment of Creative Teaching Method, when compared with the traditional method of teaching geography did not produce differential effect upon the creative thinking in geography of eighth graders.

(2) The mental ability of 'verbal comprehension, verbal analogies, memory for paired associates, location of central idea, ability to see classes, elaboration and logical evaluation under the creative thinking in geography of eighth graders could be developed significantly because of the treatment of Creative Teaching Method when compared to the traditional method of teaching geography.

(3) Traditional method of teaching geography produced higher mean scores for the mental ability of memory for word meaning (MMT) than the Creative Teaching Method in eighth graders.

#### 5.4.0. Achievement in Geography

As discussed under caption 4.1.1 three achievement tests (ACHA, ACHB and ACHC) have been administered in geography. The discussion of results for these three achievement tests will be presented under caption 5.4.1. The hypothesis to be tested is -

Hypothesis VIII - There is no significant difference in the achievement in geography between the group taught through the Creative Teaching Method and the group taught through the traditional method.

#### 5.4.1. Discussion of Results for Three Achievement Tests (ACHA, ACHB and ACHC)

The effects of teaching geography through Creative Teaching Method upon achievement in geography of eighth graders were analysed by employing analysis of covariance technique where the covariates were SES, intelligence and general creative thinking. For achievement test I in geography, the F-ratio of 5.16 is significant at 0.05 level with df 1/69, (vide Table 4.16). The adjusted means of achievement I in geography of the experimental and control groups are 44.87 and 59.92 respectively. This implies that the treatment has effected

significantly upon the achievement I in geography of eighth graders.

The obtained F-ratio for achievement test II in geography was significant at 0.01 level, ( $F = 8.71$ ,  $df 1/69$ , vide Table 4.17). The adjusted mean scores of the experimental group is significantly higher than that of the control group. This reflects that the treatment has significant more effect upon achievement II in geography of the eighth graders as compared to the traditional method of teaching geography.

The F-ratio for achievement test III in geography is 1.06 which is not significant (vide Table 4.18). This implies that the treatment has no differential effect upon achievement III in geography of eighth graders.

From the above three results of ANCOVA, it is revealed that the treatment of Creative Teaching Method has significant effect upon the achievement I in geography and achievement II in geography of eighth graders and no differential effect on achievement III in geography of eighth graders. The finding of the Creative Teaching Method, being significantly more effective for achievement I in geography and achievement II in geography is in line with the findings of Rusch et al (1967) and Carey (1975). Rusch et al. (1967) in their study tried to foster creativity in the sixth grade students in order to find its effect on achievement. They found that fostering creativity did not have a negative effect on achievement. Carey (1975)

investigated the effect of the training in thinking skills on the academic achievement of fifth and sixth grade students in reading and arithmetic. The treatment used was training the experimental group in the Productive Thinking Programme in a 15 lesson programme extending over 18 weeks. The results revealed that there were significant differences on the Stanford Achievement Test for sixth grade students, but no significant differences were achieved on any of the tests for fifth grade students.

The finding for achievement III in geography, that is the treatment has no differential effects on achievement compared with traditional method is not similar to Rusch et al. and Carey. But Brandt's (1974) finding is similar to the present one. He conducted an experiment to find out the effects of developmental group counselling and creativity training on creativity, adjustment and achievement of fifth grade children. Nine of the 13 elementary schools of the North Penn School District in a Philadelphia suburb was randomly selected. Three schools were randomly assigned to three groups engaged in developmental group counselling focussed on creative thinking and specific developmental tasks. This group also experienced daily classroom creativity training with their teachers. The second group experienced similar creativity training with their teachers, but had no group counselling. The third group was no treatment control group. The experiment demonstrated that

there were no differential effect of group counselling creativity training on creativity adjustment and achievement of fifth grade children.

The reasons that can be attributed to the present results of achievement III in geography being not significant may be that the difficulty level of geography taught during that particular experimental period considerably increased and the students could not cope up with that. In this regard, it is fit to state that the lessons given during the period of experiment were based on the prescribed syllabus, and the contents of the textbook for the course were graded according to the accepted principle of 'from easy to difficult' and from 'known to unknown'. Therefore, it can be said that only <sup>the</sup> the normal increase of difficulty of subject as the lessons proceed was experienced by the students.

It may be also be hypothesised that the effectiveness associated with novelty of the new method must have worn out towards the end of the experiment. But it may be said that the topics and the variables for the problems were different at each time. Although the techniques of the Morphological analysis and Brainstorming were the same, the different variables of the different problems kept the interest of the student on, towards the Creative Teaching Method and the novelty was not lost.

To examine the nature of the effect in terms of their direction, the means of the scores of the achievement I in



geography, achievement II in geography and achievement III in geography were compared separately for the control and experimental groups by applying t-test. The results indicated that both the t-values for the mean achievement on achievement test I in geography and achievement test II in geography for the control and experimental groups were found to be significant at 0.01 level (  $t = 2.71$  and  $3.30$  respectively, vide Table 4.19). In both the cases, the experimental group had higher mean scores than the control group. The t-value for the mean achievement on test III in geography for the control and experimental group is found to be not significant.

In order to find the total effect of the treatment upon achievement in geography of eighth graders, t-test was applied, for the combined mean scores of the three achievement tests in geography for control and experimental groups. The t-value was significant at 0.01 level, ( $t = 2.78$  vide Table 4.19). The combined mean scores of achievement in geography of the control and experimental groups are 40.19 and 50.30 respectively. Hence it is conveyed that the treatment has significant effect upon achievement in geography. Therefore, the hypothesis (H - VIII) as stated at the beginning of this caption that there is no significant difference in achievement in geography between the group taught through the Creative Teaching Method and the group taught through the traditional method is rejected.

From the above discussion the following conclusions can be derived :

(1) The Creative Teaching Method compared to the traditional method of teaching geography produced higher mean performance scores on the achievement in geography of eighth graders.

(2) The Creative Teaching Method did not produce any negative effect upon achievement in geography of eighth graders.

Thus, in this study eight hypotheses were tested after analysing the data by employing the technique of analysis of covariance. Out of that the hypotheses relating to convergent production abilities in geography and achievement in geography of eighth graders (Hypotheses V and VIII) were rejected. The other hypotheses relating to general creative thinking (H-I), cognition abilities in geography (H - II), memory abilities in geography (H - III) divergent production abilities in geography (H - IV), evaluation abilities in geography (H - VI) and creative thinking in geography (H - VII) were not rejected.

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