C H A P T E R   T W O

METHOD AND PROCEDURE

C H A P T E R II

METHOD AND PROCEDURE

2.0.0 Introduction

The present chapter in the traditional sense should
include the procedure of conducting the study. But the conduct
of the pilot sutdy and its results have been included in this
chapter. The reasons for the same are: (i) the pilot study
provides rationale and guide lines for the final study and
its methodology, and (ii) the report of the pilot study is
so small that it cannot be given space for a full chapter.

The present investigation was aimed at studying the
effect of the Creative Teaching Method, which had the compo-
nents of Morphological analysis, Brainstorming and traditional
method, upon the general creative thinking, creative thinking
in geography and achievement in geography of eighth graders. The
study was conducted in the following three phases, such as,
(i) the pilot study, (ii) the test construction study, and
(iii) the final study. Table 2.1 shows the specific object-
ives of each of the phases.

TABLE 2.1   THE THREE PHASES AND THE RESPECTIVE OBJECTIVES
OF THE STUDY

Phase	Name	Objectives
Phase I	Pilot study	To work out the details of the design of the Creative Teaching Method
Phase II	Test constru-ction study	To develop and standardise the Geography Achievement Test on SI Model, and To develop three achievement tests in geography
Phase III	Final study	To find out the effect of the Creative Teaching Method upon (i) general creative thinking, (ii) creative thinking in geography and (iii) achievement in geography of eighth graders

In the following paragraphs a detailed description of
the pilot study (phase I), a brief description of the test
construction study (phase II), and the final study (phase III)
are given.

2.1.0   Pilot Study (Phase I)

The purpose of the pilot study was to design the Crea-
tive Teaching Method suitable to average class room situations
and to find out its feasibility. The Creative Teaching Method
comprises the components of Morphological analysis, Brain-
storming and traditional method. The details of the techniques

of Morphological analysis and Brainstorming are given under captions 1.6.1 and 1.6.2 respectively.

2.1.1 Sample for Pilot Study

The pilot study was conducted in the city of Baroda. There were eight English medium high schools in Baroda. Considering the proneness to innovation, standard of students and proximity to the investigator, it was resolved to take up Navarachana High School, for the pilot study. Table 2.2 presents the sample selected for the purpose of the pilot study.

TABLE 2.2   SAMPLE FOR PILOT STUDY

Institution	Grade	Boys	Percentage	Girls	Percentage	Total	Percentage
Navarachana High School, Baroda.	7	26	56.5	20	43.5	46	100
	8	22	55.0	18	45.0	40	100

2.1.2 Treatment

The proposed treatment of teaching geography through the Creative Teaching Method was given to the seventh and eighth grade students of Navarachana High School, by the investigator for a period of more than two months during Novermber, December 1974 and January 1975. Detailed lesson plans were prepared. The investigator established rapport with the students before he actually started introducing the new method. This

was possible by teaching geography through the traditional

method for about two weeks. After having understood the

school climate and established the rapport with the students,

the investigator introduced first the Brainstorming with

traditionl method for about a month, and Morphological

analysis with tradtional method after that. Two lessons,

each of 40 minutes duration were given per week for the tea-

ching of geography for each of the said classes. It may be

stated here that the components of the Creative Teaching

Method have some special features and they could not be intro-

duced in all lessons. To make the class room environment

suitable for the introduction of the new method, it was felt

that traditional method of teaching was also necessary along

with Morphological analysis and Brainstorming. More than that,

certain topics were not suitable for Morphological analysis

or Brainstorming. Such topics were completely dealt with

through traditional way of teaching. Table 2.3 shows the list

of topics and the methods of teaching by which it was covered

for the respective grades.

TABLE 2.3   TOPICS AND METHODS OF TEACHING

Grade	Traditional method	Brainstorming	Morphological analysis
VII	(1) North America location, size, western cordille-ras, Eastern high lands	(1) Climate of North America	(1) Utility of for-ests in N.America.
		(2) Rain fall in North America	(2) Pastoral produ-cts of N. America.
	(2) Canadian shield and Great central plains, rivers	(3) How agriculture is successful?	(3) Consumption of agricultural pro-ducts.
	(3) Political divi--sion	(4) Requirements for the development of manufacturing indus-try	(4) Different ener-gy systems possi-ble in N.America.

Grade	Traditional method	Brainstorming	Morphological analysis
VII	(4) Agricultural resources of North America (5) Forests of North America (6) Fisheries	(5) Industries of Fall line belt	
VIII	(1) Denudation, transportation, deposition (2) Work of rivers glaciers, under ground water (3) Europe, position, size, structure (4) Climate of Europe (5) Agriculture and pastoral products of Europe (6) Europe: Transport and population (7) Europe-trade	(1) Uses of volcanoes (2) Effects of ocean currents (3) Summer conditions of Europe (4) Vegetation of Europe (5) How Europe becomes the most important of all the continents	(1) Different energy systems of Europe (2) Industrial development of England (3) Industrial development of France

2.1.3 Experiences Gained

As a result of the pilot study, the following experiences were gained, which helped as guidelines for the final study.
(1) The investigator felt that both Morphological analysis and Brainstorming could be adapted to the seventh and eighth grade class room situations.

(ii) The Morphological analysis, which is comparatively easier, more interesting and concrete for the students, may be introduced first in the final study. The reason behind is that in Morphological analysis, the students tried to find out the various possible combinations of new ideas for the given problem from the morphological chart. This practice in producing new idea combinations by Morphological analysis may help the students in following the Brainstorming technique and its principles for the production of ideas.

(iii) From the experiences gained, it was realised that Morphological analysis and Brainstorming could not be introduced for two different periods separately. Instead it could be mingled with tradtional lesson wherever possible.

(iv) It was realised that the original plan of introducing this new method for some topics for a full period was difficult. During the pilot study, it was found that the techniques of Morphological analysis and Brainstorming were difficult to be continued for the whole period. A period means roughly 40 minutes of teaching time. Hence, depending upon the topic, the problem, and the interest of the students the time span for these techniques may be varied from five minutes to 30 minutes. Therefore it was decided to introduce these techniques at any time during the period of teaching whenever the adoption of these techniques are possible and suitable. It was also decided that as soon as these techniques ceased during a period, the investigator shall adopt the traditional method of teaching without any loss of time and

break of continuity in teaching the students.

(v)   As discussed earlier under caption 1.6.2, in Brainstorming, there are two parts such as, idea session and evaluation session. In between these two sessions, some days or atleast somehours of gap is prefered, because, during this time some other new ideas about the problem may come to the mind. From the pilot study, it was found that if possible, it was easy for the investigator to introduce the Brainstorming at the later part of a period, so that by the end of the period he could finish only the idea session. In the next class, evaluation session could be conducted. During this gap between the idea session and the evaluation session, students may thinkover the problem consciously or unconsciously and may come out with some other new ideas. A good planning of the lessons before hand would help in arranging the idea and evaluation sessions as described above.

(vi)   For the conduct of the experiment, it would be better to ask the students to bring a rough note book for the geography class, so that they could write all the notes of the idea session or the Morphological chart as rough work, at the first instance. After the evaluation sessions, the students may be permitted to take down the points in their regular geography note books.

(vii)   During the pilot study the investigator tried various methods of recording the ideas of the Brainstorming session, which is a vital step of this techniques. The original idea of using a tape recorder to record the suggestions given was abandoned because it will create an artificial

situation in Indian class rooms. More than that, the purpose of the study was to find out the possibilities of the introduction of these methods in ordinary class room circumstances. From the experience of the pilot study the investigator found the following procedures of recording easy and convenient.

If the problem is small and to be introduced in the beginning of a period, the investigator himself will write the ideas suggested on the black board, then and there quickly. This procedure helps all the students to participate in the idea session. The evaluation of the ideas can be done immediately by looking into the ideas which are there on the black board. If the problem is comparatively long and the evaluation session is to be conducted in a latter period the class can be divided into two groups as A and B. This is possible by dividing the class into two, according to the students seating srrangements or according to the rows of benches or according to serial number of students, or any other method which is suitable to the situation. The students shall be sufficiently instructed as to which group has to record the suggestions and which one to participate in the session. The recordings shall be made in the idea session in their rough note books, which will be taken up for evaluation in the next period. Those students who participated in the idea group in one session will record in the next session and vice versa. The experiences gained from the pilot study were incorporated in the final study.

2.2.0.0 Test Construction Study (Phase II)

In order to measure the creative thinking in geography and the achievement in geography of eighth graders, a few tests were developed. For measuring creative thinking in geography, a Geography Achievement Test on the lines of Structure of Intellect Model of Guilford (1956) was developed and standardised. For measuring achievement in geography, three tests, suchas, Achievement Test I in Geography, Achievement Test II in Geography and Achievement Test III in Geography were developed.

2.2.1.0 Geography Achievement Test on Structure of Intellect Model (GATSI)

This test was constructed on the lines of Guilford's structure of intellect model. According to this model of Guilford (1956), each factor of the intellectual ability has been conceived with three dimensional qualities, taken one from each of the three parameters, such as, Operations, Contents, and Products. The three kinds of classification of factors of intellect is usually represented by means of a single solid model as shown in the diagram under caption 3.2.2. The details about the construction and standardisation of the test is given in chapter III. The GATSI test construction is of two parts: (i) Item analysis study, and (ii) Reliability and validity study. Different samples were drawn for these two studies. In the following paragraphs description about the sample for the two studies is discussed.

2.2.1.1 Sample for Item Analysis Study(GATSI)

For purposes of the Item Analysis study the investigator selected four schools randomly two from the city of Baroda and two from the city of Madras, out of the English medium high schools of the two cities. Since it was decided to conduct the final study in the state of Tamilnadu, it was thought right to include eighth grade students of Tamilnadu also in the sample. Table 2.3 shows the details of the student's sample selected for item analysis study of the GATSI.

TABLE 2.4 SAMPLE FOR ITEM ANALYISIS STUDY (GATSI)

S.No	Institution	Grade	Boys	Percentage	Girls	Percentage	Total	Percentage
1.	Baroda High School, Baroda,	8	44	63	26	37	70	100
2.	VidyaKunj High School, Baroda.	8	40	57	30	43	70	100
3.	Central School, Guindy Madras.	8	20	63	12	37	32	100
4.	Rani Meyyammai High School, Madras	8	-	-	28	100	28	100

Of the above four schools Vidya Kunj High School, Baroda, and Central School, Guindy, Madras were following the Central School syllabi, whereas, Baroda High School, Baroda, and Rani Meyyammai High School, Madras were following their respective state syllabi. The sample drawn was of eighth graders having

the mean age of 14 years.

2.2.1.2 Sample for Reliability and Validity Study (GATSI)

The reliability and validity studies were conducted on a sample of sixty subjects. This sample of eighth graders was selected from two schools, one each from Baroda and Madras. Their mean age is 14 years. Table 2.5 shows the sample selected for the reliability and validity study of GATSI.

TABLE 2.5 SAMPLE FOR RELIABILITY AND VALIDITY STUDY (GATSI)

S.No	Institution	Grade	Boys	Percentage	Girls	per centage	Total	Per centage
1.	Baroda High School, Baroda.	8	16	53	14	47	30	100
2.	Central School, Guindy, Madras.	8	14	47	16	53	30	100

2.2.2.0 Achievement Tests in Geography

To measure the achievement in geography of eighth graders, no suitable and standardised test was available. Hence, it was decided to develop the achievement tests in geography for the purpose of this study. Since the investigator wanted to see the effect of the treatment at different periods of

the experiment, three achievement tests covering different contents were developed. The details of the development of these achievement tests are given in chapter III under caption 3.3.

2.2.2.1 Sample for Item Analysis Study (Achievement Test I in Geography, Achievement Test II in Geography and Achievement Test III in Geography)

For computing the item analysis for the achievement tests a sample of two classes were drawn from the same schools, selected for final study. Since the testing period and content of the tests were different, the same sample was used for getting the data for item analysis for all the three achievement tests. Table 2.6 describes the sample of eighth graders selected for item analysis of the three achievement tests.

TABLE 2.6   SAMPLE FOR ITEM ANALYSIS STUDY (ACHIEVEMENT TESTS)

S.No	Institution	Grade	Boys	Percentage
1.	Voohrees High School, Vellore.	8	30	50
2.	Krishna Swamy Mudaliar High School, Vellore	8	30	50

2.2.2.2 Sample for Reliability and Validity Study (Achievement Test I in Geography, Achievement Test II in Geography, and Achievement Test III in Geography)

A sample of 60 eighth graders from two sections (30 each)

of the two high schools of Vellore town was selected for the purpose of the reliability and validity studies. These two sections of eighth graders were different from the sections selected for item analysis study. Table 2.7 describes the sample selected for reliability and validity study.

TABLE 2.7   SAMPLE FOR RELIABILITY AND VALIDITY STUDY (ACHIEVE-MENT TESTS)

S.No	Institution	Grade	Boys	Percentage
1.	Voohrees High School, Vellore.	8	30	50
2.	Krishna Swamy Mudaliar High School, Vellore	8	30	50

2.3.0   Final Study (Phase III)

The final study employed Multifactor covariance design having experimental and control groups. The three covariates were socio economic status (SES), intelligence and creativity. The criterion variables of the study were: general creative thinking, creative thinking in geography and achievement in geography of eighth graders. The experimental design in schematic form is given below in Table 2.8

TABLE 2.8   SCHEMATIC PRESENTATION OF THE EXPERIMENTAL DESIGN

Three covariates: i. Socio economic Status
ii. Intelligence
iii. General Creative Thinking

<u>Experimental group</u>	<u>Control group</u>
N=35	N=36
Treatment variable:	Treatment variable:
Lessons through Morphological analysis plus Brainstorming, plus traditional method for four months.	Lessons through traditional method for four months.

Criterion variables:

i. General creative thinking
ii. Creative thinking in geography
iii. Achievement in geography.
(Achievement in geography was measured at three intervals of 11 lessons duration in each case)

2.3.1.0   Treatment

The treatment variable in this study was the teaching
of geography through the 'Creative Teaching Method' (a compo-
analysis,
nent of Morphological/and Brainstorming and traditional
method).

2.3.1.1   Teaching Units

The units of teaching were selected from the geography

text book prescribed by the Tamilnadu Gvovernment for eighth
grade pupils of the State. The units of teaching selected for
the study are presented below in Table 2.9

TABLE 2.9 TOPICS AND METHODS OF TEACHING

S.No	Topic	Method
1.	The Americas- A historical survey	Traditional method
2.	Peoples who have settled in the Americas	Do
3.	North America-location, size and coastal line	Do
4.	North America-physical features	Do
5.	How are the different rivers of North America useful?	Morphological analysis
6.	Political divisions	Traditional method
7.	Facts to be kept in mind about the climate.	Do
8.	Suggest ideas about the summer conditions of North America	Brainstorming
9.	Suggest ideas about the winter conditions of North America	Do
10.	Rain fall: summer and winter	Traditional method
11.	How is the climate of North America affected by the ocean currents and wind system?	Morphological analysis
12.	Come forward with ideas about the agricultural resources of North America.	Brainstorming
13.	List ideas, how agriculture in North America is quite profitable?	Do
14	How does the utility of forests differ in North America? why and why not?	Morphological analysis

S.No	Topic	Method
15.	Where are the different pastoral products produced? why and why not?	Morphological analysis
16.	List ideas how fisheries could flourish in North America.	Brainstorming
17.	Come forward with ideas for the different uses of multi-purpose project	Brainstorming
18.	What are the different energy systems possible for different purposes in North America?	Morphological analysis
19.	Farming practices of North America.	Traditional method
20.	Corn and wheat belts.	Do
21.	What are the different ways of consumption of agricultural products in North America?	Morphological analysis
22.	List ideas how North America achieved success in manufacturing industries	Brainstorming
23.	Industries: Great lakes and St: Lawrence region	Traditional method
24.	Suggest ideas for the better use of 'Fall line' phenomena	Brainstorming
25.	When and how industries could flourish in a country?	Morphological analysis
26.	Industries: Fall line belt and western region	Traditional method
27.	North America: transport-roadways and railways	Do
28.	Suggest ideas - why passenger traffic on railways in North America decreased.	Brainstorming
29.	Water ways and Airways	Traditional method
30.	Come forward with your points, how eastern region is densely populated in North America.	Brainstorming

S.No	Topic	Method
31.	Which regions of North America are industrially developed? why and why not?	Morphological analysis
32.	Population of North America	Traditional method
33.	Trade of Canada, U.S.A	Do

All the above 33 units of teaching were from chapters five to 12 of the geography text book of eighth graders. The subject of geography was selected because, it gives more scope for creative thinking compared with the other school subjects. The units mentioned above were selected according to the sequential order given in the text book. The units of teaching were selected from the prescribed text book, because, it was thought that that way the experiment would be conducted in a natural setting and that the time of the students would not be wasted during the course of the experiment. It was also thought that the pupils would take more interest in the content, as it was from their own course book.

2.3.1.2 Preparation of lesson plans

To facilitate the teaching, detailed lesson plans for the teaching units were prepared. One model lesson plan for each of the Morphological analysis, Brainstorming, traditional method, Morphological analysis plus traditional method and

Brainstorming plus traditional method is given in the appendix.

2.3.1.3 Teachers

Training of teachers in introducing the Creative Teaching Method is quite possible. But it requires a detailed programme of planning and sincere co-operation from the school authorities. As the methods taken up for treatment happens to be creativity technique, it needs keen attention and sincere adoption of the principles into the classrooms. Taking into consideration, the facilities and the other factors that were available to the investigator and also with a view to avoid unnecessary administrative problems, besides the fact that the investigator could satisfy all the requirements needed of the study, it was decided that the investigator himself could teach through the Creative Teaching Method.

In order to match the investigator with the control group teacher, the investigator took certain precautions. Even though the investigator was more qualified in content knowledge than the control group teacher, the investigator stooped to the level of the eighth grade teacher. Besides that, he sat for five periods in the control group teacher's class in geography and observed the method of teaching of the control group teacher in teaching geography lessons.

This facilitated the investigator to adjust his traditional
lessons similar as that of the control group.

2.3.2 Sample for Final Study

The data related to the three covariates, such as, SES,
intelligence, general creative thinking and the criterion
variables of general creative thinking, creative thinking in
geography and achievement in geography were collected from
two groups of eighth grade English medium students of Vellore
town. The details about the collection of data are given in
chapter IV under caption 4.1.1. Table 2.10 presents the
sample selected for the final study.

TABLE 2.10   SAMPLE FOR FINAL STUDY

S.No	Institution	Group	Boys
1.	Voohrees High School, Vellore.	Control	36
2.	Krishna Swamy Mudaliar High School, Vellore.	Experimental	35

2.3.3 Tool Description

For this study two types of tools were used. They were:
(i) tools already standardised, and (ii) tools developed for
the purpose of this study. The first type, that is the already
standardised tools were used to collect the data relating to

the covariates, such as, SES, intelligence and general creative thinking. For this, (i) the Kuppuswamy Socio Economic Status Scale- Form A , (ii) the Madhookar Patel Intelligence Test, and (iii) the Passi Tests of Creativity (verbal) were used respectively.

To test the first criterion variable of general creative thinking, again the Passi Tests of Creativity (verbal) were used. The other two criterion variables of (i) creative thinking in geography, and (ii) achievement in geography were tested by two tools developed for the purpose, by the investigator. They were, Geography Achievement Test on Structure of Intellect Model and three Achievement Tests in Geography, such as, Achievement Test I in Geography, Achievement Test II in Geography and Achievement Test III in Geography, respectively. A brief description of the tools used in the study will be given in the following paragraphs.

(i) The Kuppuswamy Socio Economic Status Scale

The Socio Economic Status Scale, by Kuppuswamy was administered to the sample to measure its socio economic status. The author developed this scale for urban as well as rural population of India. In the present study, the scale for urban population was used as the sample was from the urban area. The scale can be administered to both the individual and the group.

This scale contains items related to three variables, such as, education, occupation, and income. These variables have seven items in each. The variables of education includes the following items: (i) professional degree or Hon^5_s, M.A., and above, (ii) B.A., or B.Sc., degree, (iii) intermediate or post high school diplomas, (iv) high school certificates, (v) middle school completion certificates, (vI) primary school or literacy certificates and (vii) illiterate. The variable of occupation includes (i) profession, (ii) semi-profession, (iii) clerical, shop owners, farm owners, etc., (iv) skilled worker, and (v) semi skilled workers, (vi) unskilled labourers and (vii) unemployed. The variable of income includes (i) above 1000 per month, (ii) between Rs 750 and 999, (iii) between Rs 500 and 749, (iv) between Rs 300 and 499, (v) between Rs 101 and 299, (vi) between Rs 51 and 100, and (vii) below Rs 50. The validity of the scale was established by using 'matching against outside criterion', 'distribution patterns', and 'comparison of dichotomous groups' methods.

(ii) The Madhookar Patel Intelligence Test (MPIT)

The Madhookar Patel Intelligence Test is a test of general intelligence. This intelligence test provides two scores for each student. An I.Q. and a Grade Expectancy score. The grade expectancy score shows the school level of the students' ability. The MPIT is a group test suitable for the students of eighth grade and above. This test avoids any

cultural content, presents geometrical drawings, designed
to test the students' powers of abstract reasoning and space
perception. The different reliability co-efficients ranges
from 0.88 to 0.94. Concurrent validity coefficients ranged
from 0.65 to 0.80, when measured against other local verbal
and nonverbal tests of intelligence. Factor analysis showed
that the test measured a 'general factor of intelligence'.

(iii) The Passi Tests of Creativity (PTC)

This battery of tests was constructed by Passi under the
guidance of Dr. P.Deo and standardised by employing school
population. It consists of both verbal and non-verbal tests
of creativity, and is available both in English and in Hindi.
It includes six tests, namely, (i) The Seeing Problems Test,
(ii) The Unusual Uses Test, (iii) The Consequences Test, (iv)
The Tests of Inquisitiveness, (v) The Square Puzzle Test,
and (vi) The Blocks Tests of Creativity. In the present study
only the three verbal tests (first three) were used.

The nature of the tests permit freedom of responses
both qualitative and quantitative within specified time-
limits, thus ensuring suitability of the tools for measuring
divergent thinking. Instructions and practice items are
given before the actual commencement of the administration
of the different teats. The subjects are supposed to write
their responses in the specific response sheet provided for

the purpose. The test-retest reliability of the three verbal

PTC which were used in the present study are as follows:

(i) The Seeing Problems Test   0.78

(ii) The Unusual Uses Test   0.97

(iii) The Consequences Test   0.71

The split-half reliability of the above three tests are, 0.88

0.51 and 0.80 respectively. Factorial validity of the tests

against factors, viz., verbal creativity and nonverbal crea-

tivity ranged from 0.305 to 0.745. The three tests chosen

for the study can be administered individually as well as

in group. Each test is for eight minutes duration. The scoring

system of the PTC was adapted in accordance with the nature of

responses given by the sampled subjects from the town of

Vellore. Details about the scoring of the three tests are

given below.

(i) The Seeing Problems Test: Each accepted response is

given a credit of one score representing seeing problem.

(ii) The Unusual Uses Test: With this test, the dimensions

of fluency, flexibility and originality are measured. The

fluency score is obtained by counting the total number of

acceptable response. Flexibility is represented by the

number of different categories of responses for which

a five point scale from zero to four was developed in order

to assign weightage to a response according to its level

of commonness. The greater the fluency of occurence of a

particular response in group, the more is the commonness
and the lower is its score of originality and vice-versa.
(iii) The Consequences Test: This test is designed to measure
the dimensions of fluency and originality. Fluency is repre-
sented by the sum total of accepted responses on the test.
The score of originality is represented by the total
number of indirect and remote responses. The summated
scores of fluency and originality represent a score of
creativity as measured by the Consequences Test.

(IV) Geography Achievement Test on Structure of Intellect
     Model (GATSI)

This is a test specially constructed and standardised
by the investigator for the purpose of the present study.
This test is different from the ordinary achievement tests.
The items, instead of measuring the usual knowledge, com-
prehension, application, etc., it tries to measure 30 mental
abilities which can be categorised under five main operations
such as, Cognition, Memory, Divergent production, Convergent
production and Evaluation. As discussed earlier under caption
2.2.1, this test was constructed on the lines of Guilford's
Structure of Intellect model. It includes Semantic content
items in geography for all the products, such as, units,
classes, relations, systems, transformations, and implications
for all the above said five operations. Hence, the test has
30 items (5 operations x 6 products), each having two parts.
The item analysis of the test was done in two different ways,

such as , (i) for the unianswer type of items, (ii) for the multianswer type of items. The coefficient of split-half reliability was 0.92. The concurrent validity of the test against the criterion of school achievement was 0.57. The time required for the administration of the test is one hour. The details of the development of the test have been given in chapter III. A copy of the test is attached in appendix E.

(V) Achievement Test I in Geography (ACHA), Achievement Test II in Geography (ACHB), and Achievement Test III in Geography (ACHC)

These were the tests developed by the investigator covering the course of the eighth grade geography during the experimental period. These tests were having items to test the students' knowledge, comprehension and application in geography. The test-retest reliability of the Achievement Test I in Geography, Achievement Test II in Geography and Achievement Test III in Geography were 0.78, 0.77 and 0.65 respectively. The concurrent validity of the above tests were 0.51, 0.67 and 0.49 respectively. The details of the development of the tests have been given in chapter III. The copies of the tests have been attached in appendix F, G, and H.

Table 2.11 presents the different variables and tools used in this study with their nature and codes.

TABLE 2.11 VARIABLES, NATURE, TOOLS AND THEIR CODES

S.No	Variable	Nature	Tool	Code
1.	Socio Economic Status(SES)	Covariate	The Kuppuswamy SES scale	SES
2.	Intelligence	Do	The Madhookar Patel Intelligence test	MPIT
3.	General creative thinking (CYPT)	Do	The Passi Tests of Creativity	PTU
4.	General creative thinking (CYAT)	criterion	The Passi Tests of creativity	PTC
5.	Cognition abilities in geography (CMP)	Do	Geography Achievement Test on Structure of Intellect Medel	GATSI
6.	Memory abilities in geography (MMP)	Do	Do	Do
7.	Divergent production abilities in geography(DMP)	Do	Do	Do
8.	Convergent production abiliteis in geography(NMP)	Do	Do	Do
9.	Evaluation abilities in geography (EMP)	Do	Do	Do
10.	Creative thinking in geography	Do	Do	Do
11.	Achievement I in geography	DO	Achievement Test I in Geography	ACHA
12.	Achievement II in geography	Do	Achievement Test II in Geography	ACHB
13.	Achievement III in geography	Do	Achievement Test III in Geography	ACHC

2.3.4 Statistical Techniques Used

Statistical techniques had to be used for developing

Geography Achievement Test on SI Model, and three Achieve-

ment tests in Geography, and also for analysing the data
in order to test the various hypotheses. A brief summary of
the various techniques used in this study are given below:

(i) The simple technique of counting the frequencies of the
responses for a particular item from the lower and higher
27 percent of the sample was used to find out the extent of
its possible difficulty and variability which were employed
as criteria for making the choice of the item of the Geog-
raphy Achievement Test on SI model.

(ii) Biserial correlation was computed for unianswer type
items to find out their discrimination index.

(iii) The computation of mean, SD and 't'-value were worked
out to find out the difficulty and discrimination of the
items of multianswer type items.

(iv) Split-half method was applied to establish the relia-
bility of GATSI in which Product Moment Coefficient of corre-
lation was worked out.

(v) Test-retest method was applied to establish the reliability
of the three achievement tests in geography. The product
moment correlation was employed for this purpose.

(vi) The concurrent validity of GATSI was established by
computing product moment coefficient of correlation with
the test score with eighth grade annual examination geography
scores of the same students.

(vii) The concurrent validity of the three achievement tests were established by computing product moment coefficient correlation of the test scores with their terminal examination geography scores of the same students.

(viii) Analysis of multi-covariance was applied to find out the effect of the treatment upon the adjusted criterion variables.

(ix) The t-test was employed to find out the significance of differences of the effect of the treatment between means related to different sub-parts of the criterion variables.