Chapter - III
Method of
the Study...
METHOD OF THE STUDY

In the previous chapters, a theoretical framework of variables, significance of the problem, development and description of the various tools were discussed. The present chapter has been devoted to the method of study, which focuses around the tools used, the samples, design of the study, procedure and the statistical techniques used for the purpose of the data analysis.

TOOLS USED

The following tools were used for collecting data:

- Mastery learning instructional packages consisting of: ML- GEN and ML- ANAL. (Developed and validated by the investigator),
- Entry behaviours test (developed and validated by the investigator),
- Formative unit tests developed and validated by the investigator,
- Criterion test (developed and validated by the investigator),
- Standard Progressive Matrices (SPM) sets A B C D and E (Raven, 1960),
- Group Embedded Figures Test (GEFT) of cognitive style (FD/FI) developed and standardised by Witkin et al. (1971), and

SAMPLE

Sampling is an important aspect of life in general and enquiry in particular. We make judgments about people, places, and things on the basis of fragmentary evidence (Garrett, 1966; 1981; Edwards, 1968; Smith, 1975). The adequacy of a sample i.e. its lack of bias, depends upon our knowledge of the population as well as the method used in drawing the sample. Population refers to all cases under investigation and a sample is an actual subset of observations drawn at random from a population (Calfee, 1975). A population is the theoretical set of all possible observations for a particular experiment (Calfee, 1975). If the observations are numbers, then the population is described by the distribution function of the observations, which gives the probability of occurrence for each possible numerical value. In statistical terminology, the items that make up a test constitute a sample from a much larger collection, or population of items that might have been used in that test (Ebel and Frisbie, 1991).
The sample can thus be described by a distribution of proportions propelling the probability distribution of function. The sampling distribution can be thought of as the result of repeating a sampling operation many times with a fixed sample size, and calculating a statistic like mean from each sample. At the same time, the sampling distribution of statistics gives us a way of relating the sample estimate to the population parameter. It provides a way of determining the significance level of a given result under the null hypothesis (Garrett, 1966; 1981; Ebel, Frisbie, 1991).

The size of the population places an upper limit on the size of the sample that can be drawn from it (Ebel and Frisbie, 1991). The sample cannot be larger than the population (Garrett, 1966; Calfee, 1975; Robson, 1996; Ebel, and Frisbie, 1991). The larger the population, the more likely it is to be heterogeneous, i.e. to include diverse and semi-independent areas of knowledge or ability. In order to achieve equally accurate results, a somewhat larger sample is required in a heterogeneous than in a homogeneous domain (Robson, 1996). A large sample will always yield a sample statistics closer to the population parameter than a more limited sample (Garrett, 1966; 1981). The larger the sample, the smaller the sampling errors are likely to be and such errors are not caused by mistakes in sampling (Ebel and Frisbie, 1991).

A Sampling procedure is representative if every sub-class eventually occurs with the same proportion in the sample as in the general population (Garrett, 1966). In probability sampling, statistical inferences about the population can be made from the respondents of the sample. It is therefore sometimes referred to as the representative sampling (Robson, 1996) where the sample is taken as a representative of the population (Garrett, 1966).

Various techniques have been devised for obtaining a sample, which will be representative of its population. Most commonly used sampling techniques are:

- Random Sampling
- Stratified or Quota Sampling
- Incidental Sampling, and,
- Purposive Sampling
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The descriptive term *random* is often misunderstood. It does not mean that the sample has been chosen in an offhand, careless and haphazard fashion (Garrett, 1966; 1981). Random sampling means that we rely upon a certain technique of selection called random to provide an unbiased cross section from the larger group or population. This involves selection of the required number of persons or cases from the sample. Random selection assures that the observations will be representative of the performance of the appropriate reference group and free of systematic bias. In random assignment, selection of the subjects is done in such a way that every subject in the population is equally likely to be selected and assigned to a particular experimental group. Thus, random sampling:

- Yields samples that are representative of the population and that are free of systematic bias
- Avoidance of systematic bias, which generally occurs when there is a non-random selection procedure (i.e. a person is assigned to be in a condition depending on his particular characteristics);
- Ensures that for any sample of subjects, there is no bias in assigning any person to any particular treatment group.

The criteria for randomness are met when:

- Every individual in the population or supply has the same chance of being chosen for the sample;
- The selection of one individual or thing in no way influences the choice of another.

Thus, randomness in a sample is assured when we draw similar and well-shaken up slips out of a hat or numbers in a lottery (provided it is honest) or a hand from a carefully shuffled deck of cards. In each of these cases, selection is made in terms of some mechanical processes and is not subject to the whims or biases (if any) of the experimenter.

**Stratified sampling** is a technique designed to ensure representativeness and avoid bias by use of modified random sampling method. It is applicable when the population is composed of sub-groups or strata of different sizes so that a representative sample must contain individuals drawn from each category or stratum in accordance with the sizes of the sub-groups. Within each stratum or sub-group, the sampling is random or as nearly as
possible. This involves dividing the population into a number of groups or strata where members of a particular group share a particular characteristic. Stratum A may be females and stratum B males of the same age grade say 13+ to 16+ years studying in IX grade.

**Incidental sampling** is sometimes referred to as accidental sampling. It is applied to those groups, which are used chiefly because they are easily or readily obtainable. School children, college students are readily available, and laboratory animals are also readily available at all times in numbers and under conditions none of which may be of the experimenter’s choice. Such casual groups rarely contribute random samples of any definable population.

In **purposive sampling**, a sample is built up which enables the investigator to satisfy his specific needs in the project. The principal of selection in purposive sampling is the investigator’s judgement of the typicality of his interest. A sample may then be expressly chosen because in the light of the available evidence, it mirrors some larger groups with reference to a given characteristic (Garrett, 1966; 1981; Stodola and Storodahl, 1967).

Investigators following the Grounded Theory Approach (Glaser and Straus, 1967; Straus, 1987; Robson, 1996) carry out initial sampling, and from analysis of the results, extend the sample in ways guided by their emerging theory sometimes referred to as the theoretical sampling. Random sampling formulae apply more or less accurately to purposive samples (Garrett, 1966).

The sample in the present investigation was drawn at two levels:

- The School Sample and
- The Student Sample.

**The School Sample:**

The School Sample was drawn from the representative Secondary Schools wherein the medium of instruction was English. A list of the Schools under the administration of the Union Territory of Chandigarh was procured from the Director Public Instructions (Schools) through the District Education Office. In order to get relevant information from Schools, the investigator sought permission to visit Schools from the Director Public Instructions (Schools), Union Territory, Chandigarh following the normal procedures. Permission was granted vide Appendix III A and III B.
In order to satisfy the real effort in experimental research, the logical statistical inference of purposive sampling was initially employed. Initially, permission was granted for nine Model Secondary Schools whose medium of instruction was English. In order to arrive at the final sample, out of the nine Schools for which permission was granted (Appendix IIIA), the investigator employed the random sampling technique. This technique provided an unbiased cross section of the larger group (population). It involved the selection from the sampling frame, the exact required number of samples from the population of nine Model Secondary Schools, which equally stood likely to be selected.

Thus, names of nine schools were written down in separate sheets of papers of equal sizes. The names were folded into six symmetrical equal parts and put in an enclosed carton box. The lid was then sealed and the box was shaken up many times for easy shuffling to take place. Satisfied, the investigator carefully made a slit, which the hand can easily slide through in and out without any hindrance. Again another shuffling was done by hand as in the form of a lottery. Satisfied once more, the investigator drew out the first four cards one by one bearing the names of each School, which represented the population under investigation. The Principals of these Schools were approached. Since the investigator had written permission from the District Education Officer (DEO), not a single Principal of these four Schools objected to conduct this research experiment. Rather, they welcomed the investigator and showed keen interest in the instructional plans of mastery learning. The names of the Schools along with the number of students selected for the experiment have been listed in the Table 3.0.

<table>
<thead>
<tr>
<th>SN.</th>
<th>NAME OF SCHOOL</th>
<th>BOYS</th>
<th>GIRLS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Government Model Sec. School Sector 10 A, Chandigarh</td>
<td>70</td>
<td>66</td>
<td>136</td>
</tr>
<tr>
<td>2.</td>
<td>Government Model Sec. School Sector 22A, Chandigarh</td>
<td>61</td>
<td>52</td>
<td>113</td>
</tr>
<tr>
<td>3.</td>
<td>Shivalik Public School Sector 41B, Chandigarh</td>
<td>90</td>
<td>53</td>
<td>143</td>
</tr>
<tr>
<td>4.</td>
<td>Shishu Niketan Model Sec. School Sector 22-B, Chandigarh</td>
<td>76</td>
<td>81</td>
<td>157</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>297</td>
<td>252</td>
<td>549</td>
</tr>
</tbody>
</table>

Table 3.0

School-wise Distribution of the Initial Sample
The Student Sample:

The study was conducted on 549 IX grade Secondary School students studying in the Union Territory of Chandigarh, which were affiliated to the Central Board of Secondary Education (C.B.S.E.) New Delhi. The age of these students ranged between 13+ to 16+ years. The age and gender –wise distribution of the sample has been presented in Table 3.1.

### Table 3.1

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of schools</th>
<th>Males: Age in years</th>
<th>Females: Age in years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>13+</td>
<td>14+</td>
<td>15+</td>
</tr>
<tr>
<td>1.</td>
<td>Govt Model Sec. School Sector 10-A, Chandigah</td>
<td>8</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>Govt. Model Sec. School Sector 22 A, Chandigah</td>
<td>11</td>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>Shivalik Public School Sector 41 B, Chandigah</td>
<td>11</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>4.</td>
<td>Shishu Niketan Model Sec. School, Sec.22B Chandigarh</td>
<td>14</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>44</td>
<td>118</td>
<td>71</td>
</tr>
</tbody>
</table>

Along with the Entry Behaviour (EB) Test information was sought regarding income and socio-economic (SES) Levels of the students' parents on the basis of which, the students were classified into three groups of High (SES), Middle (SES), and Low (SES). School-wise distribution of the sample on SES has been placed in Table 3.2 below.

### Table 3.2

**Distribution of the Initial Sample on SES**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of School</th>
<th>High (SES)</th>
<th>Middle (SES)</th>
<th>Low (SES)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Government Sec. School Sector 22A, Chandigarh</td>
<td>10</td>
<td>89</td>
<td>14</td>
<td>113</td>
</tr>
<tr>
<td>3.</td>
<td>Shivalik Public School Sector 41B, Chandigarh</td>
<td>25</td>
<td>98</td>
<td>20</td>
<td>143</td>
</tr>
<tr>
<td>4.</td>
<td>Shishu Niketan Model Sec. School Sector 22B, Chandigarh</td>
<td>45</td>
<td>97</td>
<td>15</td>
<td>157</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>103</td>
<td>376</td>
<td>70</td>
<td>549</td>
</tr>
</tbody>
</table>
**Sample Distribution on the Basis of Intelligence:**

The Standard Progressive Matrices (SPM) was administered to ensure that the group of students in all the four Schools got a wider coverage with regard to intelligence. Hence, to match the groups on intelligence, SPM scores were divided into High, Average, and Low groups and the distribution of the initial sample on intelligence were checked and have been presented in Table 3.3.

**Table 3.3**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of School</th>
<th>ML-GEN (Generalization)</th>
<th>ML-ANAL (Analogy)</th>
<th>CGL (Conventional Group Learning)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High Group Average Group Low Group</td>
<td>High Group Average Group Low Group</td>
<td>High Group Average Group Low Group</td>
</tr>
<tr>
<td>1.</td>
<td>Government Model Sec. School, Sec.10A, Chandigarh</td>
<td>-</td>
<td>-</td>
<td>69</td>
</tr>
<tr>
<td>2.</td>
<td>Government Model Sec. School, Sec.22A, Chandigarh</td>
<td>-</td>
<td>-</td>
<td>52</td>
</tr>
<tr>
<td>3.</td>
<td>Shivalik Public School Sector 41B, Chandigarh</td>
<td>73</td>
<td>47</td>
<td>23</td>
</tr>
<tr>
<td>4.</td>
<td>Shishu Niketan Model Sec. School, Sec.22B, Chandigarh</td>
<td>-</td>
<td>-</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>73</td>
<td>47</td>
<td>23</td>
</tr>
</tbody>
</table>

**Distribution of the Final Sample:**

In order to ensure that for any sample of subjects there was no bias, great care was taken while assigning the sample to any particular treatment group. Two papers representing two treatments were written down in two separate sheets of papers of equal sizes. The papers were folded into six symmetrical parts and dipped into an enclosed carton box measuring 30cm x 30cm x 15cm. As had been stated earlier, the box was shaken-up many times for easy shuffling to take place. The investigator personally drew out the first and second cards and accordingly allocated them to the treatment groups. One group was considered as experimental group, wherein; students were imparted instruction through Mastery Learning Strategy (MLS).
Method of the Study

Group I was taught through Mastery Learning Strategy (MLS) with Generalization as Advance Organizer (ML–GEN.). Group II was taught through Mastery Learning Strategy (MLS) with Analogy as Advance Organizer (ML–ANAL.); and Group III was the Control Group, which was taught through Conventional Group Learning (CGL) by their own teachers. During the process of instruction, some students dropped out at one stage or the other. The structure of the final sample comprised of N= 509 students, has been shown below in Table 3.4.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>INSTRUCTIONAL TREATMENTS</th>
<th>BOYS</th>
<th>GIRLS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ML- GEN.</td>
<td>78</td>
<td>52</td>
<td>130</td>
</tr>
<tr>
<td>2.</td>
<td>ML- ANAL.</td>
<td>67</td>
<td>81</td>
<td>148</td>
</tr>
<tr>
<td>3.</td>
<td>CONVENTIONAL GROUP LEARNING (CGL)</td>
<td>123</td>
<td>108</td>
<td>231</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>268</td>
<td>241</td>
<td>509</td>
</tr>
</tbody>
</table>

It was also ensured that each treatment group and control group had adequate number of students of Field Dependent /Field Independent (FD /FI) classified on the basis of cognitive style scores. The structure of the final sample based on cognitive style has been given below in Table 3.5.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Treatment Groups</th>
<th>Cognitive Style</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ML – GEN.</td>
<td>Field-Dependent (FD)</td>
<td>36</td>
</tr>
<tr>
<td>2.</td>
<td>ML – ANAL.</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>Control Group Learning (CGL)</td>
<td></td>
<td>130</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>194</td>
</tr>
</tbody>
</table>

DESIGN OF THE STUDY

A research design is the plan, structure, and strategy of investigation conceived so as to obtain answers to research questions and to control variance (Lindquist, 1956). Definition of the term experimental design is comparatively
restricted (Brooter, 1999). The term is used in Fisher Tradition; to state statistical principles underlying experimental designs and their analysis, wherein an experimenter can schedule treatments and measurements for optimal statistical efficiency. It contains activities like procedure for selection of factors and their levels of manipulation, identification of extraneous variables that need to be controlled, procedures for handling experimental units, selection of criterion measure, selection of specific design, and analysis of data (Brooter, 1999).

Winer (1971) has compared the design of an experiment to an architect's plan for the structure of a building. The designer of experiment performs a role similar to that of the architecture. The design is the general structure of the experiment, not its specific content (Myers, 1980). The designer of an experiment has to do the planning of the experiment so that the experiment, on completion fulfils the objectives of the research (Brooter, 1999). Educational research is therefore described as experimental if and when the researcher has:

- Firstly, specified the finite set of researchable hypotheses and
- Secondly has established a systematic programme of data gathering, under precisely defined conditions in an effort to test these hypotheses (Ingersoll, 1982).

A good experimental designer should provide some information with respect to all the objectives of the experiment (Winer, 1971), and be kept as simple as possible (Montgomery, 1994).

The present study employed an experimental method with a 3 x 2 factorial design. Computational procedures were followed according to the techniques given by Winer, (1971) and Brooter, (1999). In the 3 x 2 factorial design, instructional treatment and cognitive style were two independent variables. Out of these two independent variables, ML instructional treatment was studied at three levels viz:

- Mastery Learning with Generalization as Advance Organizer (ML-GEN.),
- Mastery Learning with Analogy as Advance Organizer (ML-ANAL), and
- Conventional Group Learning (CGL).

Whereas the second independent variable, the cognitive style was studied at two levels only viz:

- Field – Dependent (FD)
- Field – Independent (FI).
The dependent variable in the present investigation was the Learning Outcomes.

For further specifications, Learning outcomes at cognitive domain were focused around Academic Achievement and those of affective domain were concerned about the Self-Esteem of the learners. Two separate analyses were done on these learning outcomes belonging to the two domains of behaviours. A Schematic layout of the design has been presented in Fig. 3.0 and 3.1 below:

**Figure 3.0**

![Diagram LEARNING OUTCOMES (Academic Achievement)](image)

**Figure 3.1**

![Diagram LEARNING OUTCOMES (Self-Esteem)](image)
Where:
♦ FD = Field-Dependent
♦ FI = Field-Independent
♦ ML-GEN = Mastery Learning with Generalization as Advance Organizer,
♦ ML-ANAL = Mastery Learning with Analogy as Advance Organizer and,
♦ CGL = Conventional Group Learning

CONTROLS FOR EXPERIMENT

Control Variables

One of the main contestants in every empirical study is that conclusions always have to be inferred from observations (Norton, 1952; De-Klerk, 1979). Identification and control of relevant variables are two of the most critical tasks confronting most researchers (D’Amato, 1970). Although the control of known or potentially relevant variables is often not difficult to accomplish, their identification frequently requires insight and ingenuity (Church, 1964; Rescorla, 1967; Solomon, and Lessac, 1968; Seligma, 1969). The matter of detecting unrecognized relevant variables rests entirely with the experimenter’s perceptiveness (Solomon, and Lessac, 1968). The reason the experimenter wishes to control known and potentially relevant variables is to avoid repetition and contamination (Seligma, 1969). One goal of experimental research is to determine how the independent variables of the study affect the dependent variables (D’Amato, 1970). Most control measures fall into one of the three general types of control techniques: Matching, Randomization, and Counterbalancing.

In matching techniques, the investigator obtains full control of the relevant variables for a particular experiment being investigated (Church, 1964; Scriven, 1967; D’Amato, 1970). Control is achieved by equalization of the effects of the relevant variables over all values of the independent variable of the study (Seligma, 1969). And this may be well equated in a particular experiment particularly if the number of the total sample involved is small (Rescorla, 1967). Counterbalancing techniques on the other hand, can provide either type of control i.e. equalization of the effects of the relevant variables in the single experiment or over the long run (Rescorla, 1967).
In the present investigation, the controls were exercised using these control techniques:

- Matching of the groups was one control wherein all the relevant variables were controlled. The groups were matched on all the relevant variables like intelligence, age, gender, socio-economic status, and Entry Behaviour of the learners etc. This was essential also because; three instructional treatments were administered in three different schools to avoid contamination. The control of this experimental variable was also exercised by assigning the same teacher to all the treatment groups. Hence Pre-tests, Post-tests and instructions were imparted under similar conditions of classroom environment and instructions. Since the experimenter could not administer the treatment exactly in the same period of time, there remained a gap of almost twenty days for each school. This limitation was however overcome by employing a 3x2 ANOVA on gain scores and the initial differences were taken care of by the statistical analysis.

- Randomization was another control, which was exercised for the allocation of students to various treatment groups.

**PROCEDURE**

Two main stages were adopted as the procedure of the experiment. These two stages were:

- Selecting the sample,
- Conducting the experiment

**Stage: i. Selecting the Sample:**

The sample was selected at two levels: The School Level and the Student Level. Four Schools with 509 students were selected for conducting the experiment. The procedures adopted for the selection of sample have already been discussed under the heading “Sample”.

**Stage: ii. Conducting the Experiment:**

The experiment was conducted in four phases as stated below.
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Phase I: Matching the groups: Administration of the Entry Behaviour (E.B.) test, Intelligence test, SES information and cognitive style test,

Phase II: Administration of Pre-test, Criterion test and Self-esteem Inventory test,

Phase III: Implementing the instructional programme: Implementing the mastery learning strategies,

Phase IV: Administration of the Post-tests: A criterion post-test and Self-Esteem Inventory.

Phase I: Matching the Groups (Pre-Pre Testing)

Before implementing the Mastery Learning Instructional Packages, the tools for matching the groups were administered viz: Test for Entry Behaviour (E.B.), Standard Progressive Matrices for intelligence and information for family income for S.E.S.

Entry Behaviour (E.B.) describes the behaviour the students must have acquired before they can be instructed for particular new terminal behaviours. It is the present status of the students' knowledge and skills in reference to a future status the teacher wants them to attain. It is also the starting point where the instruction must always begin and is quite different with terminal behaviour where the instruction concludes.

Before starting the instructional programme, all the selected students were given an entry behaviour test. Scores of this test were used to determine whether or not the students had the adequate entry behaviour required for the instructional treatments. Incase where the students did not fulfill the condition of entry bevaviour, they were provided orientation before entering into the instructional programme.

The group was also matched with regards to age, gender, S.E.S., and intelligence. As explained under the heading sample, the subjects fell under the age range of 13+ to 16+. Both male and female IX graders were selected in the final sample. The students came from a wide variety of cross section of the society and the final sample comprised of adequate number of high, average, and low SES. Although students' cognitive style was one of the independent variable, the Group Embedded Figures Test (GEFT) was used to identify Field-
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Dependent and Field-Independent (FD/FI) subjects. The test was administered during its first phase so that it is scored in advance. And check that all the four school sub-samples had adequate number of Field-Dependent/Field-Independent students. Table 3.6 shows the School-wise Date Schedule for Test Administration for Pre-Testing of Students.

Table 3.6
School-wise Date Schedule for Test Administration for the Pre-testing of the Students

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of School</th>
<th>(PRE-PRETESTING SCHEDULE)</th>
<th>(PRE-TESTING SCHEDULE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SES EB Test</td>
<td>SPM Test</td>
</tr>
</tbody>
</table>

Phase II: Administration of Pre-Test: (Self-Esteem Inventory and Criterion Test)

Since the final analysis was done on the gain scores of the two dependent variables viz: Academic Achievement and Self-Esteem, Self-esteem Inventory and Criterion tests were administered to all the selected groups. Separate answer sheets were provided for criterion test. Scoring was done to obtain the information regarding knowledge of the students on the topics to be taught through the experimental treatment. No time limit was imposed for completing pre-test so that a clear and exact level of students regarding instructional content is assessed. Time limit would have forced the learners to leave the test even if
they knew the content. The sequence of the test was the same in all the four schools. The schedule of pre-testing is contained in Table 3.6.

**Phase III: Implementing the Instructional Programme**

In Mastery Learning Strategy (MLS), the acquisition of the subject matter involves a chain of learning in a way that no single link could be broken out without all the subsequent links being lost (Torshen, 1977). Each student needs access to information appropriate for his own level if he is to obtain a maximum benefit from the time he spends in school where instruction in basic skills and knowledge continues until he has developed adequate competence. Mastery Learning Strategy (MLS) believes that it is the task of the teacher to design his/her instruction so that all who can learn well, do learn well (Block, 1974).

In addition to what Bloom’s and Keller’s Mastery Learning Strategies (MLS) can do, Ausubel’s Model, has got the potential of being used in all individual lessons or as an organizational pattern for curriculum designing (Ausubel, 1960). An organizing statement called Advance Organizer acts as a connection between the material to be learned and the learner’s cognitive structure (Eggen, Kauchak, and Harder, 1979). It also acts as a cognitive roadmap, guiding the students over the new content to be learned. Advance Organizers therefore, are instructional sets designed to provide students with an understanding of what the lesson is all about. They are one of the two cognitive strategies (the other one is Metaphors) that enable the learner to recall and transfer knowledge to the new topic (Molenda, 1993).

An advance organizer is a bridging strategy that provides a connection between one unit and another. It also acts as a schema (Molenda, 1993). This connectivity is achieved through the advance organizer, which organizes the new material to be presented by outlining, and logically sequencing the main ideas or procedures in the new material based on the learner’s prior knowledge. The organizers are some frames of references that give students conceptual frameworks into which lessons, ideas, concepts, and facts, can be placed in an organized fashion.

Thus, two formats of Advance organizers (Ausubel's Model, 1960) viz: Generalization and Analogy have been incorporated in the Mastery Learning Strategy (MLS) by the investigator. The resultant combinations were:
One treatment group was taught through Mastery Learning Strategy (MLS) with Generalization as Advance Organizer (ML - GEN),

The second treatment group was taught through Mastery Learning Strategy (MLS) with Analogy as Advance Organizer (ML- ANAL), and

The Control Group was taught by their regular (Geography) teachers in the conventional way.

Both the treatment groups (ML-GEN), and (ML-ANAL) were taught by the investigator himself so that a finer strategic differences could be taken care of.

The sequence of events through these two combined strategies of mastery learning as well as conventional group learning was as follows:

For ML-GEN:

- **Step I:** Students were motivated for the novel method of instruction,
- **Step II:** Students were encouraged to participate,
- **Step III:** The Advance Organizers (Generalization and / or Analogy) were immediately shown to the students with the help of the Over Head Projector (OHP),
- **Step IV:** Extensive use of expanded and elaborate hierarchies linking each segment of lesson and units; strengthening of cognitive organization by revisiting the principle of integrative reconciliation, and use of extended and elaborate hierarchies were the essence of the programme,
- **Step V:** Each lesson content was recapitulated and summarized at moderate intervals,
- **Step VI:** Enrichment material, relevant to the diagnosed needs of the students were implemented through those students who had achieved mastery faster than the others,
- **Step VII:** Use of chalks of assorted colours, Black-board, Black-board rulers, Audio Visual Aids, and charts, as part of instructional packages were predominant throughout the programme,
- **Step VIII:** The enrichment and remedial material was employed throughout the 12 units for the two treatment groups (ML-GEN and ML-ANAL).
Step IX: Unit-wise criterion tests were administered at the end of each unit,

Step X: Peer tutorial as a remedial prescription was used for those students who needed it,

Step XI: The investigator himself, taught the group following the guidelines developed in the lessons earlier. (These have been discussed in details in Chapter II),

Step XII: The time schedule for ML-GEN was similar to that of ML-ANAL.

For ML-ANAL:

Step I: The sequence of all the steps for this strategy was almost the same as for ML-GEN.

Step II: This group just like (ML-GEN) was also taught by the investigator himself following the guidelines as developed in the lessons earlier. (These as well, have been discussed into details in Chapter II),

Step III: Advance Organizers (Analogy) were presented first after clarification of the lesson objectives,

Step IV: Extensive use of expanded and elaborate hierarchies linking each segment of lesson and units; strengthening of cognitive organization by revisiting the principle of integrative reconciliation and use of extended and elaborate hierarchies were the essence of the programme,

Step V: Each lesson content was recapitulated and summarized at moderate intervals,

Step VI: Enrichment material, relevant to the diagnosed needs of the students were implemented through those students who had achieved mastery faster than the others,

Step VII: Use of chalks of assorted colours, Black-board, Black-board rulers, Audio Visual Aids, and charts, as part of instructional packages were predominant throughout the programme.

Step VIII: Peer tutorial as a remedial prescription was used for those students who needed it,
Method of the Study

- **Step IX:** Unit-wise criterion tests were administered at the end of each unit,
- **Step X:** The time schedule followed by this group was similar to that of ML-GEN.

**For Control Group:**
- **Step I:** This group was taught by their social study (Geography) teachers in the conventional manner. It generally refers to reading out the chapter by the students or some explanations by the teachers, solving exercises and providing notes on certain important questions,
- **Step II:** Objectives and content of twelve lessons were provided to the teacher of the control group.
- **Step III:** No unit criterion test was conducted after the completion of each unit,
- **Step IV:** The time schedule followed for this group was similar to that of the other two groups.

The time schedule for implementing two treatment instructional plan viz: ML-GEN and ML-ANAL along with conventional instruction in the control group have been given in the Table 3.7 below.
## Method of the Study

### Date-Wise Schedule for Implementing Instructional Treatment

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of School</th>
<th>Conventional Group Learning (CGL)</th>
<th>SEI Pre-Test</th>
<th>Academic Pre-test (Criterion)</th>
<th>SEI Post-test</th>
<th>Academic Post-test (Criterion)</th>
</tr>
</thead>
</table>

**Table 3.7**

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Unit I Parts I &amp; II</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
<th>XI</th>
<th>XII</th>
<th>SEI Pre-Test</th>
<th>Academic Pre-test (Criterion)</th>
<th>SEI Post-test</th>
<th>Academic Post-test (Criterion)</th>
</tr>
</thead>
</table>
Phase IV: Administration of the Post-Test

After completion of all the twelve lesson units, the criterion test was administered to all the students. Answer sheets were scored and converted into percentages. Time limit was one-hour for 93 questions. Similarly, Self-esteem Inventory was administered to analyse the gain scores on Self-Esteem as a result of experimental treatment. Students the Subject Teachers and Block Wing Master(s)and Mistress (es) were thanked for their cooperation during the entire period of the experiment.

Phase V: Scoring

All the tools were scored according to their prescribed scoring keys and the data thus, obtained was subjected to statistical analyses.

STATISTICAL TECHNIQUES

The following statistical techniques were employed for the purpose of data analysis obtained from the experiment in order to test the hypotheses:

- Graphical presentations: Bar diagrams, Line graphs, Frequency curves, were drawn.
- Error Analysis was done through Scalograms.
- Descriptive statistics like Mean, S.Ds. on intelligence, cognitive style, achievement and self-esteem were used.
- One-way ANOVA on Entry Behaviour (EB), Standard Progressive Matrices (SPM), Group Embedded Figures Test (GEFT) and Pre-test scores.
- Two-way ANOVA on gain scores of:
  - Achievement and
  - Self-esteem
- Two-way analysis of variance was employed to study impact of instructional treatment, and cognitive style on learning outcomes.
- Significant F-ratios were followed by t-test.
- Effect Sizes due to treatments were computed for the instructional treatments.