

*Method of
the
Study*

CHAPTER IV

METHOD OF THE STUDY

A well planned and the well executed educational research needs a research design which is most appropriate for the problem under consideration. In fact, research is a systematic and refined technique of thinking and reasoning, utilizing specialized tools, procedures and statistical analyses in order to obtain more fruitful, precise and accurate results of a problem. The importance of the research design for any scientific research problem cannot be under estimated. The selection of appropriate method to be employed depends upon purpose of the study, nature of the problem and kinds of data necessary for its study.

The research problem, theoretical construct of variables, the review of related studies, objectives, hypotheses and the description of tools have been discussed in preceding chapters. This chapter focuses upon the method of the study.

In this chapter an attempt has been made to present the details of the actual procedure adopted by the researcher under the following heads:

- Tools used
- Sample
- Design of the study
- Procedure of the study
- Statistical techniques used.

4.1 Tools Used

The following tools were used for collecting data:

- **Hybrid Instructional Packages:** Developed and validated by the investigator.
- **Entry Behaviour Test:** Developed and validated by the investigator.
- **Formative Tests:** Developed and validated by the investigator separately for each unit.
- **Skill of Acquiring Knowledge (Summative Criterion Tests):** Developed and validated by the investigator for modules of Chemistry, Biology and Physics.

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- **Critical Thinking in Everyday Life** by Mincemoyer, C. C.; Perkins, D. F., & Munyua, C. (2001).
- **Making Decisions in Everyday Life** by Mincemoyer, C. C. & Perkins, D. F., (2001).
- **Solving Problems Survey** by Barkman, S. & Machtmes, K. (2002).
- **Test of Higher Mental Ability in Science (THMAS)** by Sansanwal, D. N. & Joshi, A. (1989).
- **Verbal Test of Creative Thinking (TCM)** by Mehdi, B. (1976).
- **The revised Two-Factor Study process Questionnaire (R-SPQ-2F)** by Biggs, J.; Kember, D. & Leung, D. Y. P. (2001).
- **Life Skill Activities**

4.2 Sample

The sample in the present investigation was drawn at two levels

- The School Sample
- The Student Sample

- **The School Sample**

A list of 22 Govt. Model Senior Secondary Schools in Chandigarh was procured from DEO's office. The school sample was drawn randomly from these schools because basic facilities of computer laboratories were available in each of these schools. Following procedure was adopted for selecting schools.

Name of schools were written on separate sheets of papers of equal sizes. The names were folded and put into a box. The box was shaken up many times for easy shuffling. Another shuffling was done by hand as in the form of lottery. The investigator drew out the slips one by one bearing name of each school. Name of the following schools were drawn:

- Govt. Model Senior Secondary School, Sector 16-D
- Govt. Model Senior Secondary School, Sector 37-B
- Govt. Model Senior Secondary School, Sector 35-D

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After taking the permission from DEO, the principals of these schools were approached. All of the three Principals of the selected schools readily permitted for conduct of the research experiment.

These three schools were assessed for matching of general background of the students and their Entry Behaviour Knowledge (Through Entry Behaviour Test). All these schools were found to be matched. Hence Govt. Model Senior Secondary School, Sector 16-D was selected randomly for Experiment group I (HI-CL); Govt. Model Senior Secondary School, Sector 35-D was randomly chosen for Experimental group II (CL); and Govt. Model Senior Secondary School, Sector 37-D was selected as Control Group and was taught through conventional method of teaching by their own teacher.

- **The Student Sample**

It was ensured that none of the selected schools had done ability grouping. Two sections were randomly selected from each of these three schools. As such intact sections were taken from each school. The initial student sample comprised of 349 students chosen from the three randomly selected schools. The distribution of initial sample has been presented in the table 4.1

Table 4.1: Randomly Selected Schools for Experimental Treatment

S. No.	Name of the School	Initial Sample		
		Section I	Section II	Total
1	Govt. Model Senior Secondary School, Sector 16-D	62	62	124
2	Govt. Model Senior Secondary School, Sector 37-B	62	63	125
3	Govt. Model Senior Secondary School, Sector 35-D	49	51	100
Total				349

During the process of experimentation that lasted for approximately three months, some students dropped out at one stage or the other. These students were therefore dropped at the time of analysis. The final sample comprised of N = 253 students as shown in the Table 4.2.

Table 4.2: Final sample according to Instructional Treatment

S. No.	Instructional Treatment	No. of Students
1	HI-CL	87
2	CL	81
3	CGL	85
	Total	253

Distribution of final sample according to Learning Approaches has been given in the following Table 4.3.

Table 4.3: Distribution of Final Sample according to Learning Approaches

Treatment Group	Deep Approach	Surface Approach	Total
Treatment I (HI-CL) Govt. Model Sen. Sec. School, Sector- 16/D	43	44	87
Treatment II (CL) Govt. Model Sen. Sec. School, Sector- 35/D	40	41	81
Treatment III (CGL) Govt. Model Sen. Sec. School, Sector- 37/B	43	42	85
Total	126	127	253

4.3 Design of The Study

The present study employed an experimental method with pretest posttest control group design. It employed a 3 x 2 factorial design wherein the data were analyzed through 3 x 2 ANOVA. The variables under study are discussed below:

- **Independent Variable:** Instructional Mode was treatment variable which was studied at three levels:
 - Hybrid Instructions in Cooperative learning (HI-CL)
 - Cooperative Learning (CL)
 - Conventional Group Learning (CGL)
- **Dependent Variable:** Effect of the Independent variables was studied on dependent variables i.e. Life Skills. The following Life Skills were studied:
 - Skill of Acquiring Knowledge: Studied separately for Chemistry, Biology and Physics
 - Skill of Critical Thinking

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- Skill of Decision Making: Studied separately for Decision Making Ability and Factors Influencing Decisions
- Skill of Problem Solving
- Skill of Creative Thinking
- **Classifying Variable:** The students were classified on the basis of their approaches to learning. It was studied at two levels:
 - Deep Approach to Learning
 - Surface Approach to Learning

The schematic layout of design has been given in Figure 4.1:

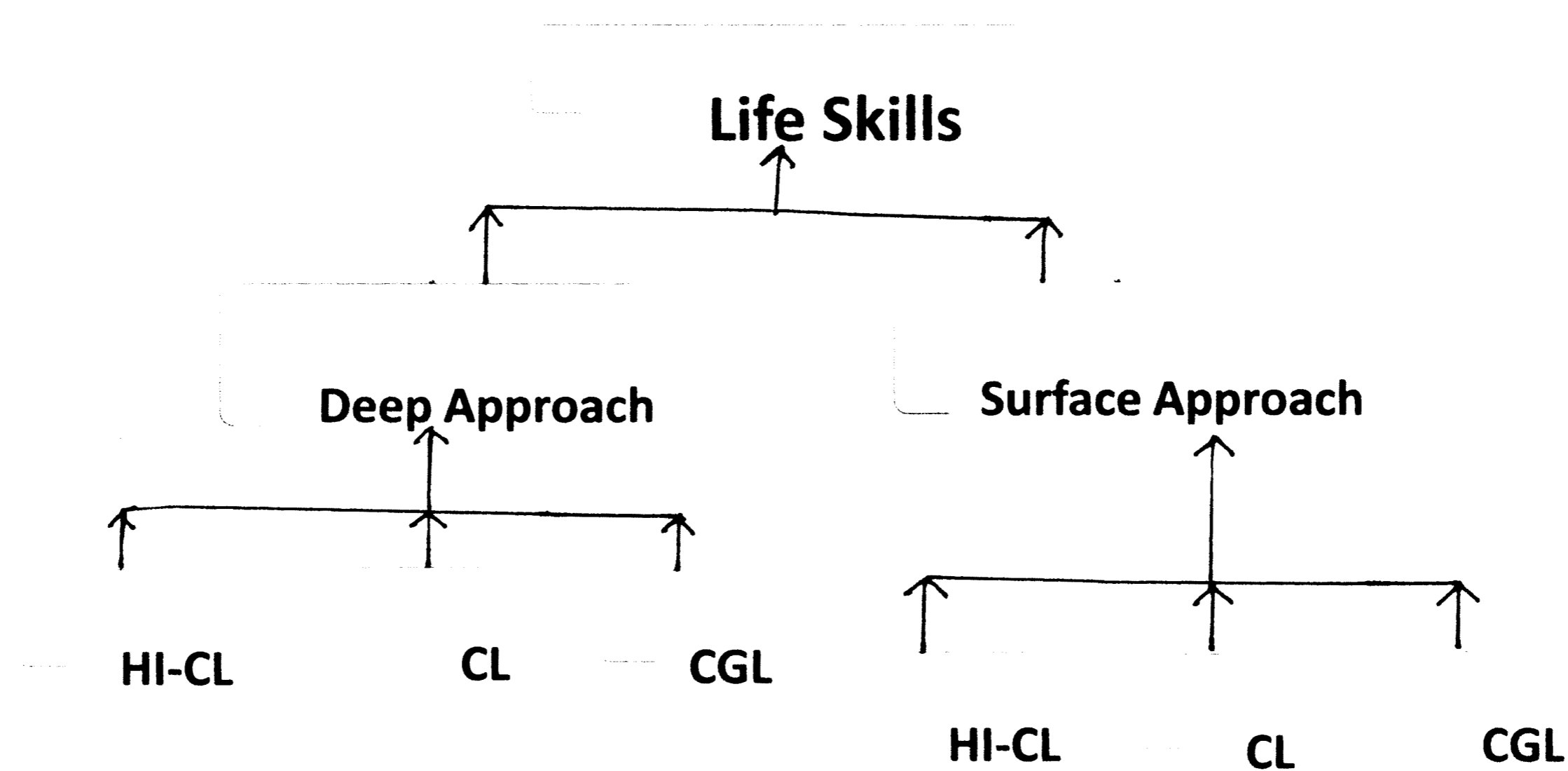


Figure 4.1: Schematic Layout of the design

4.4 Controls for Experiment

In the present study, controls were exercised using these control techniques:

- **Randomization** was one control, which was exercised at two levels. Firstly, it was done for the selection of school and second at the time of allocation of student to various treatment groups.
- **Matching** of the group was another control where all the groups were matched on the Entry Behaviour Scores. This was essential as three instructional

treatments were administered in three different schools to avoid any type of unequal distribution. The control of the experimental variable was also exercised by assigning same teacher to both experimental groups. The treatment was administered to two experimental groups on same date by the investigator herself. The limitations were overcome by employing a 3 x 2 ANOVA on gain mean scores.

4.5 Procedure

Two main stages were adopted as the procedure of experiment

- **Stage I** Selecting the Sample
- **Stage II** Conducting the Experiment

- **Stage I: Selecting the Sample**

The sample was selected at two levels: School Level and Student Level. Three schools with N = 399 students were selected for conducting the experiment. The details have been discussed in the previous paragraphs of this chapter.

- **Stage II: Conducting the Experiment**

The experiment was conducted in five phases:

Phase 1: Administration of Entry Behaviour Test and R-SPQ-2F for Approaches to Learning

Phase 2: Administration of Life Skills Pretest

Phase 3: Grouping of the students for Cooperative Learning

Phase 4: Implementation of Instructional Modules and Life Skills Activities

Phase 5: Administration of Life Skill Posttest

Phase 6: Scoring and Analysis of data.

The detailed school-wise date schedule of the experiment is tabulated in the Table 4.4.

The detail of all the phases has been discussed in following paragraphs:

Table 4.4: The Date wise schedule of the Experiment

S. No.	Name of School	EB Test/LA	Pretest of Life Skills	Chemistry						Biology			Physics			Posttest of Life Skills
				Module I	Module II	Module III	Module IV	Module V	Module VI	Module VII	Module VIII	Module IX	Module X	Module XI	Module XII	
1	G.M.S.S.S, Sector 16 (HI-CL)	4 April 2011	5 – 7 April 2011	Module I	Module II	Module III	Module IV	Module V	Module VI	Module VII	Module VIII	Module IX	25 – 27 July, 2011			
				S-I (Pre) 16 April	S-II (Pre) 25 April	S-III (Pre) 2 May	S-IV (Pre) 9 May	S-V (Pre) 19 May	S-VI (Pre) 25 May	S-VII (Pre) 1 July	S-VIII (Pre) 6 July	S-IX (Pre) 15 July				
				Module 18-23 April	Module 26-30 April	Module 3-7 May	Module 10-18 May	Module 20-24 May	Module 26-30 May	Module 1-5 July	Module 7-14 July	Module 16-22 July				
2	G.M.S.S.S, Sector 35 (CL)	4 April 2011	5 – 7 April 2011	S-I (Post) 25 April	S-II (Post) 2 may	S-III (Post) 9 May	S-IV (Post) 19 May	S-V (Post) 25 May	S-VI (Post) 31 May	S-VII (Post) 6 July	S-VIII (Post) 15 July	S-IX (Post) 23 July	25 – 27 July, 2011			
				Module 18-21 April	Module 26-29 April	Module 3-6 May	Module 10-18 May	Module 20-24 May	Module 26-29 May	Module 2-6 July	Module 11-15 July	Module 18-22 July				
				S-I (Post) 23 April	S-II (Post) 30 April	S-III (Post) 7 May	S-IV (Post) 19 May	S-V (Post) 25 May	S-VI (Post) 30 May	S-VII (Post) 7 July	S-VIII (Post) 16 July	S-IX (Post) 23 July				
3	G.M.S.S.S, Sector 37	4 April 2011	5 – 7 April 2011	S-I (Pre) 16 April	S-II (Pre) 25 April	S-III (Pre) 2 May	S-IV (Pre) 9 May	S-V (Pre) 19 May	S-VI (Pre) 25 May	S-VII (Pre) 1 July	S-VIII (Pre) 8 July	S-IX (Pre) 16 July	25 – 27 July, 2011			
				Module 18-21 April	Module 26-29 April	Module 3-6 May	Module 10-18 May	Module 20-24 May	Module 26-29 May	Module 2-6 July	Module 11-15 July	Module 18-22 July				
				S-I (Post) 23 April	S-II (Post) 30 April	S-III (Post) 7 May	S-IV (Post) 19 May	S-V (Post) 25 May	S-VI (Post) 30 May	S-VII (Post) 7 July	S-VIII (Post) 16 July	S-IX (Post) 23 July				

Same Schedule as for Experimental I (HI-CL)

Phase1: Administration of Entry Behaviour Test and R-SPQ-2F for Approaches to Learning

Before implementing the instructional programme to the experimental group, all the students were given Entry Behaviour Test to establish the equivalence of level of entry behaviour status of the students in the three instructional modes.

In order to identify the students with Deep Approach to learning and Surface Approach to learning all the students were given R-SPQ-2F.

Phase2: Administration of Life Skills Pretest

The selected tools for the Skill of Critical Thinking, Skill of Creative Thinking, Skill of Decision making, and Skill of Problem solving were administered as pretest to all the students of the selected groups.

Phase 3: Grouping of the students for Cooperative Learning

In the present study groups were made heterogeneously on the basis of marks obtained in Class VIII final Science exams. The score of students in each section was placed in descending order and divided into five quartiles. The groups were then randomly formed by selecting one member from each quartile, making a group of five students. Each student was assigned a number and daily group leader were changed in rotation. Same procedure was followed for making cooperative learning groups in two experimental treatments (viz. HI-CL and CL).

Phase 4: Implementation of Instructional Modules

The instructional procedures adopted in this study were:

- One treatment group was taught through Hybrid Instructions in Cooperative Situation (HI-CL).
- The second treatment group was taught through Cooperative Learning (CL).
- The control group was taught by their regular science teacher in the conventional way.

Both the HI-CL and CL groups were taught by the investigator herself so that fine strategic differences could be taken care of.

❖ **For Implementing Modules through HI-CL**

➤ **Instructions by the investigator to the students:** Following instructions were given to the students:

- Students were motivated to actively participate in the teaching learning process.

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- They were given orientation regarding the implementation of Hybrid Instructions.
- They were given orientation regarding the concept of Cooperative Learning and different techniques of Cooperative Learning to be followed in the present study.
- They were encouraged to participate in each and every activity.

➤ **Sitting Arrangement Plans:**

The sitting arrangements were done by the investigator in computer laboratory. The group of five students worked as a team on the same computer. Group members had to discuss the content presented through CD's among themselves and help each other to understand it so that everyone in the group can answer the question put by the teacher.

➤ **Teacher Activities:**

The role of the investigator was dynamic. While presenting the content through traditional approach she played active role. However, when the content was presented through CD and group discussions, she acted as facilitator and intervened only at the time of summarization of the content as and when required. For the smooth functioning of the Cooperative groups, investigator keenly monitored the teamwork.

➤ **Process of Instructional Package:**

- Investigator herself provided the initial guidelines and orientation to the students.
- The students were informed of what they were expected to learn. For this the investigator acquainted them with the instructional objectives before each module.
- Each module was presented in the designed format. Each module took eight to nine days to complete, which includes two formative tests and one summative test. Conducive environment was provided to the students to work in teams on the computer and discuss the content among themselves.
- Investigator daily provided them with some problem to be worked in groups as per the design of modules.

➤ **Evaluation:**

The formative tests were given to the students after the completion of each unit by using STAD technique where students were tested individually. The marks of

individual students in a team were added and the team with highest scores earned recognition. The students were informed about status so that they can work hard to make their team win. For each module two formative tests were given. After the completion of each module summative test was given to the students.

➤ **Implementation of Life Skill activities:**

During the initial days the investigator gave an orientation to the students regarding selected Life Skills. Some activities were conducted to acquaint students with the Life Skills. For the rest of the experimental period this training was given indirectly by incorporating different problem and activities in the content. Due consideration was given to present the content in a way that stimulates the thinking processes of the students. The details of activities conducted have been discussed in chapter 3. Date wise schedule of implementation of Life Skills activities conducted in the school has been given in Table 4.4.

Table 4.5: Schedule of Implementation of Life Skill Activities

Life Skill Activities	G.M.S.S.S, Sector- 16/D (HI-CL)	G.M.S.S.S, Sector- 35/D (CL)
Skill of Critical Thinking	16-20 April, 2011	16-20 April, 2011
Skill of Decision making	21-22 April, 2011	21-22 April, 2011
Skill of Creative Thinking	26-30 April, 2011	26-30 April, 2011
Skill of Problem Solving	3-6 May, 2011	3-6 May, 2011
Skill of Decision Making	7-8 may, 2011	7-8 may, 2011

❖ **For Implementing Modules through CL**

The investigator herself taught the CL group.

➤ **Instructions by the investigator to the students:** Following instructions were given to the students:

- Students were motivated to actively participate in the teaching learning process.
- They were given orientation regarding the concept of Cooperative Learning and different techniques of Cooperative Learning to be followed in the present study.
- Students were encouraged to participate in each and every activity.

➤ **Sitting Arrangement Plans:**

The sitting arrangements were done by the investigator in the class without computers. Each group consisted of five students who worked as a team. Group members have to discuss the content among themselves and help each other to understand it so that everyone in the group can answer the question put by the teacher.

➤ **Teacher Activities:**

The role of the investigator was dynamic. While presenting the content through traditional approach she played active role. During group discussion she acted as facilitator and intervened only at the time of summarization of the content as and when required. For the smooth functioning of the cooperative groups investigator keenly monitored the teamwork.

➤ **Process of Instructional Package:**

- Investigator herself provided the initial guidelines and orientation to the students.
- The students were informed of what they were expected to learn. For this the investigator acquainted them with the instructional objectives before each module.
- Each module was presented in the designed format as in HI-CL except that computers were not used in any form. Each module took eight to nine days to complete, which includes two formative tests and one summative test. Conducive environment was provided to the students to work in teams and discuss the content among themselves.
- Investigator daily provided them with some problem to be worked in groups as per the design of modules.

➤ **Evaluation:**

The formative tests were given to the students after the completion of each unit by using STAD technique where students were tested individually. The marks of individual students in a team were added and the team with highest scores earned recognition. The students were informed about status so that they can work hard to make their team won. For each module two formative tests were given. After the completion of each module summative test was given to the students.

➤ **Implementation of Life Skill activities:**

During the initial days the investigator gave an orientation to the students regarding selected Life Skills. She conducted some activities to acquaint students with

the Life Skills. For the rest of the experimental period this training was given indirectly by incorporating different problem and activities in the content. Due consideration was given to present the content in a way that stimulates the thinking processes of the students. The details of activities conducted have been discussed in chapter 3. Date wise schedule of implementation of Life Skills activities conducted in the school has been given in Table 4.4.

❖ **For Implementing through Control Group**

The control group was taught by their Science teacher in the conventional way. However, the list of objectives and content of nine modules were provided to teacher of the control group. This was mostly teacher-oriented activity. It generally refers to explaining out the chapters by the teacher as a first step and then solving exercise and providing notes for certain important questions given in NCERT book. No formative unit test was conducted after the completion of each unit. But summative tests were conducted before and after the presentation of content of each module. Time schedule followed for this group was similar to that of other two experimental groups.

Phase 5: Administration of Life Skills Posttest

After completion of all the nine modules and activities of Life Skill training, posttest for selected Life Skill were administered to all the students. At the end students' cooperation was gratefully acknowledge.

Phase 6: Scoring and Analysis of Data

All the tools were scored with the help of their prescribed keys and the obtained data were statistical analyzed as follows:

4.6 Statistical Analyses

Following statistical techniques were employed for the purpose of data analysis:

1. Graphical presentations- Bar diagrams, Frequency Polygons and Inverted Ogives were drawn.
2. Descriptive statistics namely Mean, Standard Deviation, Skewness and Kurtosis were used.
3. One way ANOVA was worked out on the entry behaviour scores.
4. 3×2 ANOVA was employed to study significance of difference among various combination groups on the selected Life Skills.
5. Significant *F*-ratios were followed by *t* test wherever required.

The analyses of data have been reported in the succeeding chapter.