CHAPTER – 3

METHOD AND PROCEDURE OF THE STUDY

The present study aims to find the effectiveness of constructivist approach to the teaching of animal classification in science and technology of standard ninth. For this purpose experimental method was selected. Instructional strategy was “Two-group only post-test purposive sample design”.

This chapter presents population, sampling procedure, the description of the experimental design, tools used, instructional procedure, method of data collection and statistical techniques employed for analysis of the data.

3.1 Origin of the Study

Initially researcher had gone for literature review of constructivism and visited various university library as well as libraries of education departments; Internet resources also provide wide range of the subject. Researcher had studied constructivist approach in his Masters in Education as a part of syllabus. Researcher was assigned to work on constructivist approach in one of the tutorials. When working on constructivist approach researcher find it interesting. From those days researcher had decided to work on constructivism. Guide suggested that better to work on topic you are most interested. Researcher had completed masters in Zoology so it is better to apply Knowledge and understanding of Zoology-content with illumination of Constructivism. Animal classification is a very important basic topic at elementary level science. The animal classification is included in Central Board Secondary Education (CBSE), Gujarat Secondary Education Board (GSEB), and Gujarat Higher Secondary Education Board (GHSEB), National Council of Educational Research and Training (NCERT) and many other state board’s Text books. The topic is also included at bachelor and master levels in Life Sciences faculty of higher education. So the researcher had decided to apply constructivist approach to the teaching of animal classification in science and technology of standard ninth

3.2 Population

In any research work, the purpose of the researcher is to find out such conclusion which can be applied universally. The characteristics of the population are
to show the marked variations from place to place, and from time to time. Therefore, the researcher has to identify the population, in order to cover the conclusion that is applicable to the population.

Students of standard nine of all secondary schools follow the text books of CBSE under NCER, New Delhi constituted the population for the present study. Other specifications are: (1) Area: Rajkot City, (2) Medium of instruction: English, (3) Standard: 9, (4) Time period: Academic Year 2009-2010 and (5) Gender: Boys and Girls.

3.3 Sampling

Sample means, a selected group of subjects from the population which represent the population. The study was conducted by means of the sample. The generalization applicable to the population, for which the sample was obtained, largely depended upon the technique of sampling.

Uchat (2004) indicate different methods of sample selection as shown in figure 3.1

![Methods of Sampling](image)

**Figure 3.1**

Methods of Sampling

(A) Probability Sampling. In probability sampling technique, probability of sample selection is equal. It means in this technique, chance of the selection of every
sample from the population is known. Four different techniques of probability sampling are: (i) Random Sampling, (ii) Stratified Random Sampling, (iii) Systematic sampling and (iv) Cluster Sampling.

(B) Non-Probability Sampling. In non-probability sampling technique, sample selection depends upon the decision of the researcher. In this technique, the chance of the selection of every sample from the population is unknown. In other words, the selections of some samples are sure and some samples can be stay-out from the selection. Three different techniques of non-probability sampling are: (i) Incidental Sampling (ii) Purposive Sampling and (iii) Quota Sampling.

(C) Specific Sampling. Specific sampling technique is generally selected in special situation. Some problems of a specific research work are different from the normal situation in which, the samples are required to be selected specifically. When special situation is required to be created for the manipulation of care, specific sampling technique is used. Four different techniques of specific sampling are: (i) Double Sampling (ii) Sequential Sampling (iii) Matched Pair Sampling and (iv) Snow-Ball Sampling.

The basic concept of purposive sampling technique is, to select the representative sample from the big population. The samples are selected on the bases of some questions like; who can represent the characteristics of population, and who can give the required information, etc…. Logic, common-sense and availability of required experimental condition are required here. Schools are having their tight academic schedule throughout the year, so very few schools are permitting for research work. Hence random sampling is not possible here. In random sampling it is not all time possible that randomly selected school will give permission for experiment, data collection and experimental work.

In the presently study, samples were selected by ‘Purposive Sampling Technique’. As the researcher decided to work at the secondary level of school, he has to select the sample from standard eight to ten. The investigator selected the students of standard nine from the sample schools. The reasons behind the selection of sample for the research work are as follows:

(1) The students of the primary level of the school may not mature enough to understand and participate in the program and it can be difficult to gather them at the
place of program manipulation for thirty days constantly. The parents of this level of students may not permit them to attend the program at the place, other than their school. (2) The students of higher secondary level may not spare proper qualitative and quantitative time for this program due to their preparation for Board-Examination. (3) From secondary level, the researcher decided to select standard nine, because standard eight is an entrance of secondary level and mind-set of the students of standard eight may be of the primary level and recently 8th is included in the primary level. Hence, the researcher stratified the sample on the base of the ‘standard of education’.

As the present study was experimental one, the researcher had decided to select two schools from the population. The researcher selected purposive sampling technique in the selection of school. Two schools of Rajkot city were purposefully selected for the present study: (1) Central School and (2) The Rajkumar College (RKC) School for the experiment and its replications respectively. The detail of the selected sample is shown in Table-3.1

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the School</th>
<th>No. of Students as Sample of the Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Central School (Kendriya Vidhyalaya), Kalawad Road, Rajkot</td>
<td>80 (40 Experimental Group + 40 Control Group)</td>
</tr>
<tr>
<td>2</td>
<td>Rajkumar College (RKC School), Rajkot</td>
<td>60 (30 Experimental Group + 30 Control Group)</td>
</tr>
</tbody>
</table>

In Table 3.1 sample schools and number of students in the sample is presented. In the experiment 40+40 students were selected in experimental and control group. While in replication 30+30 students were selected in experimental and control group.
3.4 Selection of Research Method

There are three methods used for research work. If the problem is required to be inquired/solved with reference to the past the method is ‘Historical-Research Method’. Secondly, the ‘Survey Research Method’ is used, to know about the present situation compared with the ideal situation. If the aim of the research is to check the effect of one variable on the other, means investigation is required to be carried out the result with reference to the future then ‘Experimental Research Method’ is used. The result of all the three methods will represent the past, present and future activities in the education system.

In the present study, effectiveness of constructivist approach to the teaching of animal classification in science and technology of standard nine was required to be checked, so experimental research method was necessary to be used. Therefore, the researcher determined to select two groups purposively. Hence ‘Two groups only post test design’ of experimental method is used.

3.4.1 Experimental Design of the Present Study

The experimental-design is however, most important in experimental research work. Which observations have to be taken, how to take them, how to analyze obtained information, which conclusions can be derived…. All these matters are to be decided. Thus, the selection of the experimental strategy is to be plan systematically.

The types of experimental design are (i) Pre-Experimental Design, (ii) True Experimental Design and (iii) Quasi Experimental Design. The details of all three designs are as under:

Pre experimental design can’t control the experimental situation. This design is first foot-step to be familiar with the experimental design. In this design, generally on one group first observation, then experiment, and at the end of experiment again observation is taken and the result is obtained, by the difference of pre and post observation. There are three types of pre-experimental plans. (1) Single Group Case-Study, (2) Single Group Pre-test, Post-test Design and (3) Controlled Group Stable Design.
True experimental design is generally considered as a proper design because in it, at least two groups to be formed. It is more scientific and it does not allow any comforts or adjustment in the experimental situation. It’s different types are: (1) Two Groups Randomized Sample Only Post-test Design, (2) Two Groups Randomized and Matched Pair Sample Only Post-test Design, (3) Randomized Two Groups and Pre-test, Post-test Design, (4) Solomon Randomized Four Groups Design and (5) Factorial Design.

Quasi experimental design is considered better than pre-experimental design but not as good as the true experimental design. Because only some factors which damage the internal validity can be controlled; but the total control is not possible. Two types of quasi-experimental designs are: (1) Controlled Group Non-randomized Pre-test Post-test Design and (2) Counter-Balanced Design.

In the present study Non-Randomized Two Groups only Post-test Design (as a quasi experimental design) is used. In the present study effectiveness of independent variable, method of teaching (two levels): (1) CIP and (2) traditional teaching method was required to be checked on dependent variable (achievement), thus the researcher decided to use two groups (purposive sample) only post-test design.

The equational presentation of experimental strategy used in present study was:

\[ E = 0 X_1 T_2 \quad \text{and} \quad C = 0 X_2 T_2 \]

Where, \( 0 = \) No Pre-test (\( T_1 \)) \( \quad T_2 = \) Post-test
\( X_1 = \) Experimental Teaching and \( X_2 = \) Traditional Teaching.
\( E = \) Experimental group and \( C = \) Control group.

3.4.2 Characteristics of Experimental design

Thus the experimental design is operated with following characteristics. As the problem is required to be solved by the experimental research, four matters were kept in mind, they are; (1) Arrangement, (2) Observation, (3) Control, and (4) Replication.

**Arrangement.** The arrangement is very important characteristic of an experimental research. The researcher tries to keep constant situation during the
experiment so that, other than the selected variables only the selected independent variable’s effect can be considered responsible for the variation found on dependent variable.

For the arrangement; classroom permission was taken from the respective principal, meeting was carried out with the subject teacher, proper time-schedule and dates were fixed for teaching through CIP and for traditional teaching. The necessary arrangements were looked after by the researcher. and materials like preserved animal (parrot, hedgehog, variety of snakes, crocodile, squirrel, rat, owl, wall lizard, shark, frog, salamander, electric ray fish and many more as mentioned in the detailed lesson planning Appendix-8, Appendix-9, Appendix-10), live animals (squirrel, bat, ants, grasshopper, rat, frog, wall lizard, cockroach, etc.,), Fifty A4 size color print outs of animal photographs, videos, animated movie clips, interactive CDs, DVDs on the animals, Videos of various animals from Rajkot municipal Zoo, Encarta Encyclopedia resource, Internet were arranged by the researcher. Researcher has especially made Power Point presentations (PPTs) to supplement CIP. Content topic animal classification is divided into 20 subtopics. PPTs were made for 20 subtopics separately. Each PPTs contain more than 50 slides. One model PPT of ‘mammalia’ is presented in the appendix-15. During experiment students were guided for different classroom arrangement like group discussion, role plays, Internet session, laboratory demonstration, student presentations, evaluation, etc.,. Except Zoology laboratory and computer laboratory most of the arrangements were done in the main conference hall in both the schools Kendriya Vidyalay (Central school) and Rajkumar College (for replication of the experiment). Conference hall in both the schools were well equipped so researcher has used LCD projector, tape recorder, white-board, etc,

The control group was taught in traditional classrooms strictly following Herbert Steps (Introduction, Presentation of learning objectives, Content discussion, Evaluation and Assignment) as per regular pattern by the school teacher. The teaching was included teaching with specimen presentation, charts, etc. where needed during content presentation by the teacher. Active participation of teacher was there.
The following arrangement was done in the present study:

1. School selected for the experiment was on the bases of purposive sampling technique the students were selected on the base of random sampling (one class out of four in both the schools) technique.

2. The final examination of the Science subjects of standard Eight was considered as pre-achievement and it was totally handled by the school management. The marks of the final examination as a status score in the Science subject of the samples were considered as academic achievement of the samples.

3. Firstly before the experiment teaching was done by constructivist instructional program in 9th standard in three different schools (other than sample schools of Rajkot city which include Pathak science school, Lalbahadur school and Delhi public school) of Rajkot city for 5 hours each and for the topic mammals. And based on this experience needed changes were made in the program in the presence of guide. Initial piloting was done in this way.

4. During the experiment phase the topic animal classification was taught through CIP in experimental group in both the schools, by the investigator. The control group was taught through traditional teaching by the respective school teachers.

5. After completion of the teaching post-test was given to the students of experiment group and control group. It was teacher made test but normality of the test was established.

6. An opinionnaire was given to the experiment group students to know their views about CIP for teaching animal classification.

7. As a follow work an interview was conducted of ten students of the experimental group to know their views about the constructivist instructional program.

**Observation.** The researcher observes the effect of the independent variable over the dependent variable by selecting measuring tool in the research. The researcher measures the dependent variable, achievement with the help of measurable technique, after applying experimental force. In the present study, the experiment manipulation work was divided in two schools and thirty periods of one hour in each school. The post-test was given to the students, after completion of the experiment.
Achievement tests were prepared by the researcher and that was constructed, and finalized by the help of experienced school subject-teachers, experts and the guide. The normality of the test was checked.

**Control.** The researcher controls some factors to maintain the validity of the study in every research work. Some are the variables, which affect the dependent variable during the experiment. Those are known as uncontrolled variables. The researcher does not manage these variables but take some care to control them. They are as follows:

1. Time of the experiment for all the students was kept similar in the schools, where the students from different areas were gathered for exculpation of experimental program to control the physical variables.

2. Both the schools were selected from Rajkot city, to keep the uniform school environment, where the program was manipulated to control the physical variables.

3. A variable ‘standard of the students’ was controlled by knowing status of achievement before the experiment. Status scores were collected by the respected schools.

4. A variable ‘medium of instruction’ was controlled by selecting sample from English medium schools only.

5. Content animal classification was kept uniform in both the schools, where program was executed over the students, to control a variable ‘content of the subject’

6. Post-test was given at the same time in both the schools, where program was executed, to control ‘post-test time factor’ variable.

7. Post test was again administered after three months on the control group and experiment group to see the effect of retention.

**Replication.** The researcher repeats the whole experiment on new sample as per the characteristics of experimental research. In experimental research researcher attempts to control the extraneous variables through any methods of sampling, still some discrepancies invariably remain and influence the result of the experiment. The researcher can take care of such discrepancies through the replication of the study. Replication is a matter of conducting a number of sub experiments within the frame work of an overall experimental design. In the present study, impact of controlled
variable was totally resisted during the first attempt of experiment. Then even, the researcher implicated replication of the study.

3.4.3 Validity of experimental design

Every experiment contains two kind of validity (i) internal validity (ii) external validity.

3.4.3.1 Internal Validity. Internal validity means, checking the questions like; does independent variable have any effect on dependent variable, whether the result obtained from the study is affected by unwanted variables, etc. Internal validity of the program depends upon ‘control’. In the present study, the internal validity of the experiment was checked with reference to the following controls.

Contemporary Incident. As there were no any major incident like; content based environment through co-curricular activity, change in weather, events that disturb or give new effect on the experimental variable during the manipulation of program. So, it can be said that, dependent variable was not affected by this factor.

Pre-test. The process and content of the pre-test provides experience to the sample for the post-test. So, such experience of giving pre-test and knowledge of it may affect the scores of the post-test. In the present study, there was no pre-test. Only post-test was organized on experimental and control group at the end of the experiment. So, it can be said that, pre-test experience did not affected the post-test’s result.

Maturation. In the present study the experimental treatment was for thirty days, and during this short period samples’ development was generally uniform. The experiment was planned in an academic year, so, the chances of change in intelligence, interest, etc. were almost nil; and if there is a chance of change of the same, it might be uniform change. So, it can be said that, factor ‘maturation’ might not be effected to dependent variable.

Instrument Decay. In the present study, researcher developed post-test and finalized with the help of experts and guide. The teacher made test also checked for standardize purpose. So, effect of teacher made test was controlled.
**Statistical Regression.** When the sample is selected on the bases of the end scores before the experiment, then sample tendency is to move mean of the sample’s score or is found nearer to the mean of the scores of population, whether experimental force is applied or not. This matter is called statistical regression. In the present study, sample was not selected from the ending scores. So, it can be said that, this effect was prevented.

**Selection Difference of Samples.** If experimental and control groups both differed from each other from the beginning, the result of post-test of both groups can be differed. In the present study, both groups were checked on by status score of school examination. So, this effect was not there.

**Experimental Morality.** If the sample decreases during the experiment, it can affect the result automatically. In the present study, sample was not decreased during the manipulation of the program. So, this effect was prevented.

**Interaction of the Variables.** If mean score of both the groups of sample in the beginning are equal, but if groups are differed with each other with reference to some variables like intelligence, interest, attitude, aptitude or socio-economic status, then effects of interaction of such variables can be seen on mean scores of post-test. In the present study, the sample characteristic was checked for the achievement only.

**Steadiness.** The result has tendency of non-reliability. It means it is possible that obtained result of experiment may not be the same if the experiment is carried out again. As the program is repeated, in the present study, this effect was measured by repetition of the program only. And the steadiness is resulted for these groups only.

**Expectation.** During the program manipulation, due to awareness of researcher, samples’ out-come may improve and even due to novelty of the program, expectation of sample for success of the program may be at high-level. It might not be the effect of independent variable on dependent variable but, the researcher may be misguided to believe it. In the present study, this effect can not be prevented.

**Extension of Experimental Care.** When experiment and control groups are kept close during the experiment, experimental care is extended to the control group, which affects the dependent variable. In the present study, the control group has also a treatment hence this effect was some what prevented.
John Henry Effect. When sample of the controlled group feel that, they are in the competition with the experimental group, they may do better work than their level. It affects the result of the experiment. In the present study, this effect can not be prevented but the program was under schedule and with out the competition.

3.4.3.2 External Validity. External validity means, to check the generalization, representation and extensibility of the obtained result of the experiment. To this, external validity of the experiment is for the moderation of an experiment.

The following are the factors affecting the external validity.

Interaction between Pre-test and Independent Variable. Some times, due to pre-test, sample becomes more aware towards the experimental treatment. This affects the result. In the present study, final examination of the school was considered as pre achievement. So, there was no chance of such effect in experiment.

Interaction between Sample Selection and Independent Variable. The characteristics of the sample affects extensively to the experiment. In the present study, the schools were selected through purposive sampling technique but sample was through random sampling technique from two English medium schools and the result underlined for the selected school and the sample. Thus, such effect may be prevented.

Mutual Interaction of Experimental Technique. The specialized program affects the result with comparison to formal teaching. In the present study, program was specialized so, this factor may have an effect on the result.

Explanation of Experimental Care. Some times the researcher does not present the full details of the program in the report. So, other researchers can not use it properly. Therefore, external validity of the experiment decreases. In the present study, the full detail of every aspect of CIP for the teaching of animal classification in Science and Technology of standard ninth is explained in chapter four, of this report separately, to avoid such limitation.

Obstacles of Different Experimental Methods. When the effect of different experimental methods is checked on one group during the experiment, it affects the
result. In the present study, only one experimental method was used on a group. So, this limitation could be prevented.

**Horthan Effect.** Horthan effect means, awareness of the samples about the experiment. This gives high-results. In the present study, the program was specialized. So, the effect of this factor might be possible.

**Plasbo Effect.** When the control group is kept together with the experimental group and not given them any work, the samples of the control group try to know personally that, what work is carried out in experimental group. This matter affects the result. This effect is called Plasbo effect. In the present study the control group is also treated but the effect of this factor might be possible.

**Innovation and Interruption Effect.** The effect of innovative experimental care (method, program, arrangement) on the experiment samples, affects experiment positively. In the present study, the program was innovative. So, this factor might have affected the result.

**Interaction between Post-test and Independent Variable.** While giving the response to the post-test, samples get new learning experience other than experimental care. It affects the post-test results. In the present study, an achievement test was used for the post test and the same test was used for both groups hence the effect is revealed.

**Measurement of Dependent Variable.** Pre-test and post-test are being used for the measurement of dependent variable. Different types of tools (observation, meeting, tests, questionnaire, rating scale) used in experiment, affect the result. Types of the questions utilized in various tests affect the external validity. In the present study there was no pre test and post test format for both groups.

**Interaction between History and Independent Variable.** The result of any experiment can not be generalized by going out of the time-limit of the experiment time. Some-times such incident occurs, which reduces the extensibility of the result. In the present study, steps of implementation of the CIP was selected and applied logically in a fix schedule.
**Effects of Experimental Person.** An individual difference of the experimental person (nature, voice, age, caste, dress) also affects the behavior of the sample. So, effectiveness of the experimental care cannot be generalized. This effect could not be prevented.

**Interaction between Measurement time and Independent variable.** If the post-test would be taken within the short-time after the experimental care, or after long-time, or if post-test would be taken twice and its time is different, then the result may differ. In the present study, post-test had been taken next day after the experimental care and retention effect is also measured and interpretation was made accordingly.

### 3.5 Material/Tools Development for the study

The investigator developed (1) CIP as a material/model of teaching, (2) Achievement test based on the topic animal classification, (3) an opinionnaire for the learners learned through CIP and finally (4) an interview schedule for the supportive of opinionnaire with same objective as mentioned for opinionnaire.

#### 3.5.1 Development of Constructivist instructional program

The researcher used Science Learning Cycle in the development of CIP. A learning cycle is a method for planning lessons, teaching learning process and curriculum development. The learning cycle is a way of thinking and acting that is consistent with how pupil learns. It provides an excellent approach for planning science instruction effectively. The science learning cycle originally consisted of three phases: (i) exploration, (ii) concept invention and (iii) application. It is modified and recommend as a 4-E learning cycle: (a) exploration, (b) explanation, (c) expansion and (d) evaluation. The detail of the development of this program is given in the fourth chapter.

The aim of the program was to prepare a model for teaching of animal classification. To fulfill this aim an instructional program is developed which can justify constructivist aspect of teaching and learning. Secondly researcher has to implement CIP for the teaching of animal classification. And then to compare the effectiveness of CIP with traditional instructional program for teaching of the subject.
The investigator has given the program detail of (1) concept to be invented, (2) concepts those are important to expansion, (3) materials needed for CIP, (4) safety precautions, (5) content organization and (6) behavioral changes after CIP, in chapter Four.

3.5.1.1 **Time Schedule of the Experiment.** The time schedule for the implementation of the program is given in Table 3.2

<table>
<thead>
<tr>
<th>No.</th>
<th>Administration of Teaching Technique</th>
<th>Date</th>
<th>Hours required</th>
<th>Treatments applied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CIP</td>
</tr>
<tr>
<td>1</td>
<td>Video of Zoo</td>
<td>30/11/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>2</td>
<td>Mammalia</td>
<td>1/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>3</td>
<td>Student Seminars</td>
<td>2/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>4</td>
<td>Video: mammalia</td>
<td>3/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>5</td>
<td>Video on Aves</td>
<td>4/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>6</td>
<td>Aves</td>
<td>7/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>7</td>
<td>Practical/Demonstration in Laboratory</td>
<td>8/12/09</td>
<td>2:30</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Internet activity</td>
<td>10/12/09</td>
<td>2:30</td>
<td>√</td>
</tr>
<tr>
<td>9</td>
<td>Protozoa, Porifera</td>
<td>11/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>10</td>
<td>Encarta self learning</td>
<td>14/12/09</td>
<td>1:30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coelenterata</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>11</td>
<td>Platyhelminthes</td>
<td>17/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>12</td>
<td>Explanations with photos and Aschelminthes</td>
<td>21/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>13</td>
<td>Annelida, Arthropoda</td>
<td>22/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>14</td>
<td>Activity Mollusca, Echinodermata</td>
<td>23/12/09</td>
<td>1:30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>15</td>
<td>Chordata, Cyclostomata</td>
<td>24/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
<tr>
<td>16</td>
<td>Pisces, Chondrichthyes</td>
<td>26/12/09</td>
<td>1:30</td>
<td>√</td>
</tr>
</tbody>
</table>
According to the Table 3.2 researcher had administrated CIP on experiment group student of 9th standard of Kendriya Vidyalay (Central school) and RKC School (Rajkumar college) of Rajkot city from 30/11/09 to 30/12/09. Class A was selected as experiment group and class B was selected as control group in Kendriya vidyalay and in RKC Preps (class A) was selected as experiment group and Class B was selected as control group. In table 3.2 the dates regarding post test, administration of opinionnaire, interview schedule and retention test is also mentioned. The post test administrated by researcher to the students of control group and experiment group on 31/12/09. The control group was taught by his school teachers during all these days. The experiment group students’ opinions were taken in the opinionnair on 1/1/10. On 2/1/10 experiment group student’s interview was taken to know their views about the CIP. Interview was as a part of follow up work.

**The Retention Effect.** The retention test was taken on 5/4/10 of experimental and control groups to know the level of retention. Thus in present study, total twenty-three days were required for implementing the CIP.

### 3.5.2 Implementation of Traditional Teaching Program

In traditional teaching group students were taught topics of animal classification by traditional teaching method by their school teacher. Traditional teaching program was applied to control group students as per the regular timetable of the school. Traditional teaching program included/ involved Classroom teaching, Student Seminars, Practical/Demonstration in the Zoology laboratory, Explanations with photos, teaching with PPTs, and assignment on the topic animal classification. The class room teaching was with teacher talk, questioning, studying through card about real animal and specimen. Traditional teaching had followed five steps/phase of
Herbert they are: (1) introduction, (2) statement of objectives, (3) content presentation, (4) evaluation and (5) assignment.

In introduction phase the topic animal classification was introduced by basic questions about useful animals, harmful animals, disease spreading animals, domestic animals, wild animals, etc,. In this phase photographs of animals and their videos were used. In second phase it was announced that “We are going to study about animal classification in these classes”. The teacher presented the contain points to be covered in the respective class. In third phase content animal classification was taught through classroom teaching using practical/demonstration in the Zoology laboratory, explanations with photos, teaching with PPTs, student submission on the topic animal classification suggested by the teacher, discussion, questioning, knowing about real animal and specimen, and with various such class room activities. In fourth phase animal classification related questions were asked to the students and some animal specimens/photographs were given for identification. Fifth and final phase include assignment on animal classification like Write twenty point about your favorite animal, compare between class: aves and phylum: arthropoda, compare and contrast between any two class/phylum. Write characteristics of animals you had seen in Zoo. Detailed sample lesson planning for traditional teaching is presented as Appendix-18.

3.5.3 Construction of Achievement Test

In the present study to know the effectiveness of CIP the researcher measured the achievement of learners with the help of achievement test after the implementation of independent variable. In this regard the researcher developed an achievement test on the animal classification the topic of the science subject. To prepare the test, the researcher followed the points such as: (1) deciding the objective of the test, (2) content Analysis, (3) preparing blue print, (4) writing of the test items, (5) editing of the test items, (6)expert opinions on the test, (7) piloting of preliminary form of the test and (8) final form of the test

Detail for construction procedure of achievement test is presented in chapter – four
3.5.4 Construction of an Opinionnaire

An opinionnaire was constructed by the investigator to know the student’s opinion regarding CIP for teaching of animal classification in Science and Technology of ninth standard. The scale was based on Likert method of scale construction. Each statement carried five alternatives strongly agree, agree, undecided, disagree, strongly disagree. The statement were sought from the students in an open discussion and grouped in five sections. Sections are (1) Teacher’s role, (2) Student’s role, (3) Teacher & Students Activity, (4) Nature of the learning, and (5) Value. The detail regarding construction of the opinionnaire is presented in Chapter: 4 and the tool is presented as Appendix-4 and Appendix-5.

3.5.5 Development of Interview Schedule

The investigator has also developed an Interview schedule, this tool was prepared by the researcher with the help of the guide and experts. The aim of the researcher is to prepare this tool was to evaluate the program by getting the opinions and feedbacks from the students regarding CIP. In the present study, this follow-up work was carried out with the help of an ‘Interview Schedule’ tool. The researcher had planned to take the interview of seventy students involved in the manipulation of the program. The researcher decided to get the opinions from the students by questioning them and to be noted in the interview schedule; but, the time required to finish the process of interview of a single person was expected to be minimum thirty minutes and thus, a huge time was required to take interviews of the total seventy students involved in the program. By discussing this matter with the guide and the experts, they suggested to execute this process of interview on ten percent of total students. They suggested to select sample randomly. So, the researcher had selected ten students for the interview process.

Interview Process. The interviews of the selected students were taken on hand by the researcher at different times and at different places after the manipulation of CIP. The reason behind the selection of different time for every interview was only the comfort ability of the respondent and the selection of different place was only for making a comfort zone for respondent to make the process of interview smooth and easy. All the interview of the respondents had been taken at the school campus. For the present study, the researcher had used the uncontrolled interview approach or free
interview approach with the help of some questions in mind. The researcher had taken
the interviews of students after the manipulation of the program and he had got the
opinions of them about the program. This tool is presented in Appendix-7. Following
basic questions were discussed during the Interview.

Q. 1 How was the learning experience through CIP?

Q. 2 Which types of transformations have you noticed during the implementation
of the CIP?

Q. 3 What were the roles of students during the program?

Q. 4 During this program, how the responses of the students were got by the
teachers?

Q. 5 Which support-systems were required for the teacher to take part in this
program?

Q. 6 Which type of result effects were seen in your side at the end of the program?

Q. 7 What is the basic concept of this program as per your opinion?

Q. 8 Which types of behavioral changes were seen in the students at the end of the
program?

3.6 Procedure of Data Collection

The tools were administrated in uniform sequence to obtain the data: (1) Post
test, (2) Opinion Scale, and (3) Interview Schedule.

(1) Post-test. Post-test was prepared to know the effectiveness of CIP as
compared to traditional teaching. In the science learning cycle the last learning phase
was Evaluation. The investigator administered the post test on experimental and
control group. The data thus gathered in numerical form. The investigator has to
compare the effectiveness of CIP learning with the traditional teaching, therefore post
test is required. Informal evaluation is carried out as a part of constructivist
instructional program and student also practice the evaluation phase during learning.
At the end of instructional program formal evaluation in the form of an achievement
test (post test) was applied. Initially post test (Pre primary form of post test Appendix-
11) was having 130 questions but decontaminating it in the light of difficulty value,
discriminating Indices, and effectiveness of distracters, results it in (Primary form of
post test Appendix-12) 97 questions including MCQs, true-false statements, fill in the blanks questions and match the pair questions. Final form of Post test was having 50 questions as mentioned in Appendix-3. Remaining 47 questions were used for giving practice of test to the students. Proper instructions were given to the students by the researcher at the time of test administration. Some instructions were given in the post test itself. Test was given parallel to both the groups. Most of the student in both the group took 40-55 minutes to complete the post test. Post tests were corrected by the researcher and marks were given to each answer paper. Analysis was done with the help of statistical techniques. The comparisons of both the groups were done and represented in chapter five. Post test was administered by the investigator on 31/12/09 on both the groups of both the schools.

(2) Opinion Scale. The investigator has prepared an opinionnaire to know the opinions regarding learning through CIP. The tool was helpful to get feedback from the experiment group students. In a Likert type scale the investigator got opinions of the students in regard to the instructional strategies in the tool. At the time of administration the instructions were given to the students by the researcher regarding opinionnaire that it is not a test for marks, there is not any right or wrong answers, show your views based on your classroom experience. The opinionnaire contain forty four sentences. (Appendix-5)The researcher personally administered the tool and maximum thirty minutes time was allotted. Detailed analysis of the responses of opinionnaire is given in chapter 5.

(3) Interview Schedule. This tool was also prepared by the researcher with the help of the guide and experts. The aim of the researcher to prepare this tool was to evaluate the program by getting the feedbacks from the students. The tool was prepared on the bases of frame work of model of teaching; aspects like: (i) assumptions, (ii) goals, (iii) syntax, (iv) principle of reaction, (v) social system, (vi) support system, (vii) instructional effects and (viii) nurturing effects.

Interview was kept unstructured so students can show their views on any aspect of the constructivist learning experience. Researcher had also done Video shooting of some interviews. It was really a nice experience for the researcher to know students perspective by interview. Ten students’ interview was taken and each interview took near-about 5-15 minutes.
3.7 Nature of the Data

The data was collected by the investigator after the experiment was over. Firstly to check the effectiveness the post test score was administered, opinions were sought with the help of opinionnaire and interview was held to support or validate the responses of opinionnaire.

Post test data was in the form of scores (numerical) of experimental group and control group. This was collected from both the groups after implementation of CIP and traditional instructional program. Scores was in the form of marks out of fifty. The data was quantitative and in interval scale of measurement

The opinionnaire was given by the students of experiment group and data was in the form of opinions. Opinions were taken on forty-four statements of the opinionnaire. Students had to tick on five point scale ranging from strongly agree, agree, undecided, disagree, and strongly disagree. The students’ opinions were recorded in terms of tick-mark on the category and then frequencies for each category were calculated and if the frequency is more than 90 percent than it is noted separately. Thus the data were in ordinal scale of the measurement.

In the interview schedule researcher had taken interviews of ten students and data was in the form of student’s responses and in qualitative form.

3.8 Procedure of Statistical Analysis of the Data

The interpretation is given after the analysis of the data on the basis of the objectives and hypotheses of the study. In the present study the acquired data were analyzed in following ways:

(i) The annual examination marks of standard eight of science subjects of the sample, which were collected from their schools before the experiment. Marks were collected for control group and experimental group students. The said scores were considered as the pre-achievement of the sample. Pre-achievement scores in terms of average of both groups were analyzed using t-test to know the difference between means and as a status of both the groups.

(ii) After implementation of CIP and traditional teaching method the investigator administered post-test. The Marks obtained by the control group and
experiment group students on the post-tests were collected and compared with the help of t-test. The above said scores were considered as the post achievement of both the groups and interpreted in terms of effectiveness of CIP.

For (i) and (ii) The level of significance of every hypotheses were tested by finding t-values of the mean differences of the test scores of two groups, and by this, the status of both groups and effectiveness of the program was checked.

(vii) The responses on opinionnaire were analyzed on five point scale. Five point scales ranging from strongly-agree, agree, undecided, disagree, strongly disagree. Opinionnaire’s five constructs were: (i) teacher’s role, (ii) student’s role, (iii) teacher and student activity, (iv) nature of the learning and (v) program-value. Opinions of seventy students were recorded in terms of frequency. The statement getting more than ninety percent acceptance were declared as opinion regarding cip. Thus opinions of more than 90 % were considered for the favorable interpretation.

(viii) Interview responses were analyzed qualitatively and responses of students were documented according to basic eight questions.

The presentation of data, its analysis and interpretation is presented in chapter:5. The next chapter represents development of constructivist instructional program, achievement test, opinionnaire and interview Schedule.