

# CHAPTER 3

## METHODOLOGY

### 1.0 INTRODUCTION

The main objectives of the present study were to develop a Computer based Multimedia Software Instructional Package to teach Biological concepts to the students of Standard XII, and to study the effectiveness of the package in terms of mean achievement of students in Biological Sciences. This study also aims to study the effectiveness of the package in terms of reactions of the students and teachers towards Multimedia Package in teaching of Biological Sciences. The design of the study has employed is Quasi-experimental design. The Pretest-Posttest-Experimental and Control Group Design is employed for the study. All the 30 students of Biology Group of (2010-11) of Standard XII B of Covent of Jesus and Mary School, Fatehgunj, were taken as experimental group, whereas all the 31 students of Biology Group of (2010-11) Standard XII B of Rosary High School, Pratapgunj, were taken as control group for the present study. All the 35 Biology teachers of Bio-teachers' Club, Baroda (2010-11) comprised the sample of Biology teachers.

### 3.1 RATIONALE FOR THE PRESENT STUDY

Biology as a discipline, by its very nature is media-genic. Biology is a study of life which is broadly classified into two parts, namely **Botany**, the study of the life of Plants and **Zoology**, the study of the life of Animals. Subdivisions of each of these branch include **Cytology**, that is the study of Cell and Cell structure, **Histology**, that is the study of Tissues, **Anatomy** or **Morphology**, that is the study of internal and external features of living organisms, **Physiology**, that is the study of various functions of the living organisms and **Embryology**, that is the study of the embryonic development of an individual animal or plant.

The various features of the biological contents are height, weight, length, breadth, depth, shape, size, colours, textures and sounds, pictures, diagrams, landscapes, lab experiments,

field trips, educational tours and so on. The time for the coverage of the content is limited whereas the volume is very large. Properly developed Multimedia may very well facilitate coverage of the content more efficiently and intelligibly. It may not be feasible to take the students on to the field trips for each and every bit of content coverage or to dissect in the laboratory each and every animal or plant, they study in their syllabus. Moreover, today the dissection of animals in the labs is also prohibited. Thus, the reality may be captured and mediated through a well developed Instructional Multimedia Package. Particularly in life-sciences, Multimedia has shown to be beneficial because it provides visualization of concepts that are difficult to envision. Today, we are in an age of computers, ICT and digital technologies. Media are said to be the extension of human beings which are expected to facilitate educational instruction cost effectively. In today's society, students are constantly surrounded by many aspects of technology. Allowing the use of technology in the classroom, can make learning more meaningful, exciting and enjoyable too. Once the students have discovered a purpose and passion for learning, the drive for solving problems increases. Biology is a subject that contains an inordinate amount of abstract concepts. So, using the Multimedia can aid in clarifying matters for students.

Successful student in biology should have exposure to hands-on laboratories, but when the situation does not always warrant the means for accomplishing this task, it is important to look for alternatives. As a means of enhancing the curriculum, the technology is priceless. The students can actually "see" concepts via virtual laboratories, they have the most current research/findings available, and they are taking a direct part in their learning. Due to the fact that Biology, and most other science disciplines have very broad, abstract topics, it became apparent that the traditional way of delivering instruction could be revised. Implementing technology into the classroom seemed a likely solution. Biology is a subject that involves many processes such as mitosis and meiosis. These topics can be unusually difficult for students to grasp when taught with chalk and talk method, so when a visual presentation can be used, it goes a long way as for as comprehension is concerned.

As teachers, we must present as many ways of learning to our students as possible. Lectures, laboratories, field trips, and computers are all helping our students succeed in school and in life. We must understand that technology is here to stay and it is involved in every aspect of our lives. If we allow our students to become familiar with the software available for biology (and other subjects), we can assist in opening their minds and increasing their critical thinking skills. The learning styles of students in any given classroom vary greatly. Therefore, if we include computers, we are helping to bridge the gap for those students who may otherwise tune out the subject matter.

The investigator after having graduated in Biology at Masters Level and having more than 15 years of experience in teaching Biology subject is very much keen on realizing quality Biology Education. Also, the investigator has specialized in the area of Computer Education. And therefore, the investigator has decided to develop a Multimedia Instructional Software Package to teach Biology. The investigator has not come across any study at Standard XII level on Biology teaching through multimedia.

The investigator envisaged to try his level best to make the Multimedia Instructional Software Package as comprehensive, interesting and enriching as possible, directing the concepts to the various senses of the learners optimally for their maximum involvement. Most of the students find it difficult to understand biological concepts on Animal Physiology and Reproduction as compared to other units in Biology. And therefore, the investigator thought of developing Multimedia Instructional Software Package on Animal Physiology and Reproduction for better understanding of the seemingly difficult biological concepts.

The investigator has attempted to improve the understanding of the students in Biological Sciences, using various media, such as, Power Point Presentation, Charts, Video-clips, accompanied by appropriate music, flash, animations, virtual laboratories and movie clips in the Multimedia Instructional Software Package. Students enjoy learning through various differential modes. Therefore, this study was undertaken to improve the quality of teaching and learning Biology in the classroom.

### **3.2 STATEMENT OF THE PROBLEM**

Development and Implementation of a Multimedia Package to Teach Biology to Std. XII Students

### **1.3 OBJECTIVES OF THE STUDY**

1. To develop a Computer Based Multimedia Instructional Software Package to teach Biology to the students of Standard XII.
2. To study the effectiveness of the Multimedia Instructional Software Package in terms of mean achievement of the students in the subject of Biology.
3. To study the effectiveness of the Multimedia Instructional Software Package in terms of reactions of the students towards Biological Sciences through multimedia package.
4. To study the effectiveness of the Multimedia Instructional Software Package in terms of reaction of Biology teachers towards teaching of Biology through multimedia Software Package.

### **3.4 OPERATIONALIZATION OF TERMS**

**Multimedia Instructional Software Package:** In this study, Multimedia Instructional Software Package consists of Power Point Presentation, accompanied by appropriate music, video clips, charts, movie clips, flash, animations and graphics.

**Effectiveness:** Effectiveness of the programme was studied in terms of the difference in the mean gain score of the experimental group and the mean gain score of the control group and the reactions of students and Biology teachers towards teaching of Biology through Multimedia Instructional Software Package.

### **3.5 HYPOTHESES**

1. There will be no significant difference between the mean gain scores of the experimental group and control group from pre-test to post-test.
2. There will be no significant difference between the observed frequencies and the expected frequencies against equal probability on various points of the reaction scale of the students.
3. There will be no significant difference between the observed frequencies and the expected frequencies against equal probability on various points of the reaction scale of the Biology teachers.

### **3.6 DELIMITATION OF THE STUDY**

The study is delimited to Biology textbook (2010-11) prescribed for Standard XII by GSHSEB. The research has been further delimited to 8 chapters covered in the syllabus of the Gujarat Secondary and Higher Secondary Education Board as mentioned below.

Chapter 05: Nutrition in Animals

Chapter 06: Digestive system of Cockroach & Human beings

Chapter 07: Respiration in Animals

Chapter 08: Circulation in Animals

Chapter 09: Excretion and Osmoregulation in Animals

Chapter 10: Movement and Locomotion in Animals

Chapter 11: Nervous System of Cockroach and human

Chapter 12: Reproduction and Development in Animals

### **3.7 POPULATION OF THE STUDY**

All the students of Standard XII studying in English Medium opting Biology in the schools of Baroda, following the syllabus of Gujarat Secondary and Higher Secondary Education Board (GSHSEB).

### **3.8 SAMPLE OF THE STUDY**

The sample for the proposed study was selected purposively. For this the researcher selected standard XII students studying in two schools of Baroda city. The investigator judged the availability of Computer and Multimedia LCD Projector, speakers etc, for implementing the Multimedia Instructional Software Package while deciding on the school. The willingness of the Principal and of the teaching staff was also taken into account while deciding the school. Other factors like convenience of approach and availability of time were also taken into account while deciding upon the school.

All the 30 students of Biology Group of (2010-11) of Standard XII B of Covent of Jesus and Mary School, Fatehgunj, were taken as experimental group, whereas all the 31 students of Biology Group of (2010-11) Standard XII B of Rosary High School, Pratapgunj, were taken as control group for the present study. All the 35 Biology teachers of Bio-teachers' Club, Baroda (2010-11) comprised the sample of Biology teachers.

### **3.9 METHODOLOGY OF THE STUDY**

#### **3.10 DESIGN OF THE STUDY**

The proposed study is experimental in nature where Quasi-experimental design was employed. The Pretest-Posttest-Experimental and Control Group Design was employed for the study. The design of the study is presented as follows.

$$O_1 \quad X \quad O_2$$
$$O_3 \quad C \quad O_4$$

Where,  $O_1$  and  $O_3$  are pretests

$O_2$  and  $O_4$  are posttests

X stands for Experimental group and





C stands for Control group.

For the purpose of studying the effectiveness of Multimedia Instructional Software Package in Biology, the achievement of students in Biology of experimental group and control group was considered.

### **3.11 PROCEDURE OF THE STUDY**

The entire procedure consisted of four phases for the present study.

#### ***3.11.1 Phase I: Development of Multimedia Instructional Software Package and Tools***

-  All the eight chapters of animal physiology and reproduction were selected from the English Medium Biology textbook of Standard XII prescribed by the Gujarat Secondary and Higher Secondary Education Board (GSHSEB) for the preparation and implementation of the Multimedia Instructional Software Package.
-  Content analysis of all the eight chapters was done. Thereafter, the Multimedia Software Instructional Package was developed with the help of Power Point Presentation, video clips, charts, movies, graphics, flash, and animations, accompanied by appropriate music.
-  The Multimedia Instructional Software Package was developed over a period of three months. The developed Multimedia Instructional Package was shown to two experts in the field of Biology and two experts in the field of Education to ascertain its content validity, clarity, mode of presentation and comprehensiveness. Changes were made as per the suggestions of the experts.
-  A pre-test, post-test, reaction scale for students and reaction scale for teachers were constructed by the investigator and validated by the experts mentioned above. Changes were made as per the suggestions of the experts.

### ***3.11.2 Phase II: Administering the Pre-test.***

- ✚ Before the implementation of the Multimedia Instructional Software Package, both the groups, viz., control as well as experimental were administered pretest on achievement in Biology to check the level of knowledge in Biology.

### ***1.11.3 Phase III: Implementation of the developed Multimedia Instructional Package***

- ✚ The developed Multimedia Instructional Software Package was administered on the experimental group for 5 months, 35-minutes each day, during the Biology period.

### ***3.11.4 Phase IV: Administering the Post-test and Reaction Scale***

- ✚ After the completion of the treatment with the Multimedia Instructional Software Package, the Post-test and the reaction scale were administered on the students.

## **3.12 TOOLS FOR DATA COLLECTION**

### ***3.12.1 A Pre-test and a Post-test***

A Pre-test and a Post-test were constructed on the selected chapters of Biology to study the achievement of the students. After constructing the tests, they were shown to the experts in the field for determining their correctness, language, comprehension and validity. Changes were made as per the suggestions of the experts. Answer keys, for both, the Pre-test and Post-Test were prepared to maintain the objectivity of scoring. The answer keys were given to the experts for validation. Each test consisted of forty items, to be answered in forty minutes. All the items were of multiple choice types. Each item was having four alternative answers (A, B, C and D) and the students were expected to encircle the correct answer. In every question there was only one correct answer. Each question carried one mark. All the questions were to be answered.



### ***3.12.2 Reaction Scale for Students***

The reaction scale for students was constructed by the investigator comprising the areas concerned with the Multimedia Instructional Software Package for teaching Biology. It is a five point scale. The initial draft was given to the experts for correction and suggestions and also to point out language clarity, inconsistency in the presentation and direction (positive and negative) of the statements. After receiving the feedback some of the items were modified and some eliminated. Thus the final and modified scale was having 50 items.

### ***3.12.3 Reaction Scale for Biology Teachers***

The reaction scale for Biology teachers was constructed by the investigator comprising the areas concerned with the Multimedia Instructional Software Package for teaching Biology. It is a five point scale. The initial draft was given to the experts for correction and suggestions and also to point out language clarity, inconsistency in the presentation and direction (positive and negative) of the statements. After receiving the feedback some of the items will be modified and some eliminated. Thus the final and modified scale was having 50 items.

## **3.13 DATA COLLECTION**

The data collection was personally done by the investigator from the students. The investigator prepared a time schedule for data collection. The investigator personally administered the tests mentioned above. The first step involved administering the Pretest to the students. The second step was to implement the intervention programme. This was followed by administration of the Post-test and the Reaction Scale for students and the Reaction scale for Biology teachers. Thus the required data for the study were collected.

### **3.14 DATA ANALYSIS**

Data analysis was done quantitatively by employing the t-test to find out the significance of difference between the mean gain scores of the Experimental and Control Groups. The data on the reactions of the students towards Biology through Multimedia Instructional Software Package and the reaction of teachers on Multimedia Instructional Software Package to teach Biology were analyzed through Chi-square.