CHAPTER - III
METHODOLOGY

3.1 INTRODUCTION

Research may be termed as a systemic inquiry of verified knowledge, it is an organized deliberate effort to collect information, to analyze it, to put it together and finally to evaluate it.

This chapter on methodology describes elaborately, the sample that was chosen, research design, objectives of the study, hypotheses of the study, tools used for the study, construction and validation of the tools, data collection, statistical techniques used for data and analysis.

3.2 STATEMENT OF THE PROBLEM

The higher secondary stage is a very important stage as it forms the feeder stage for higher education, both academic and technical. The quality of education offered at this stage is bound to determine the quality of further education at higher levels. So the study of human anatomy helps the higher secondary students to do higher studies like Medicine, Physiotherapy etc.
The efficacy of lecture method, also known as the chalk and talk method, in teaching science, tends to be minimal as it usually leads to boredom in students despite their having the potential for learning. The rapid emergence of Information technology has opened new vistas, though its potential has not yet been fully realized in Indian schools. Computer technology is likely to influence education enormously and play an important role in enhancing the efficiency of the teaching-learning process, making children more creative and providing them with an individualized learning environment.

It is difficult to make the higher secondary students understand the complicated concepts of human body through the traditional methods. Demonstration method may be of some help while teaching these complicated concepts. But it poses some problems while demonstrating the human body in higher secondary school laboratory. The complicated concepts related to the structure of internal organs and their functions cannot be explained effectively in the laboratory to the higher secondary students using the demonstration technique.

If the teacher explains the structure and working mechanisms of the internal organs of human body by using simulation, meaningful animated 3D models with audio effects, the concepts are retained in the mind for a longer period of time. Animations lead to greater long-term retention than simple graphics (O’Day, Danton H. 2007). By reviewing and rehearsing the animated pictures, students get an opportunity to correct misconceptions and secure additional ideas.
Hence the problem in the present study is stated as “Effectiveness of multimedia programme in perceiving human anatomy among higher secondary students”.

3.3 STAGES OF THE STUDY

1) Choosing the topic for teaching and experiment.

2) Reviewing the pertinent literature.

3) Identifying the relevant technology and tools for the development.

4) Selecting the experimental design for the study.

5) Identifying the sample for the study.

6) Classifying the subjects as control group and experimental group.

7) Developing multimedia programme for human anatomy.

8) Developing and administering the pre test for achievement in human anatomy, attitude towards Biology, achievement motivation, attention and perceptive skills to both control and experimental groups.

9) Developing and administering the pre test for attitude towards multimedia programme to the experimental group.
10) Implementation of multimedia programme as a treatment to the experimental group and providing the traditional approach to the control group.

11) Developing and administering the progress test-I, progress test-II for achievement in human anatomy to the experimental group.

12) Developing and administering the post test for achievement in human anatomy to both control and experimental groups.

13) Administering the post test for attitude towards Biology, achievement motivation, attention and perceptive skills to both control and experimental groups.

14) Administering the post test for attitude towards multimedia programme to experimental group.

15) Developing and administering the retention test for performance in human anatomy to experimental group.

16) Analysis of the data.

17) Interpretation of the data.

18) Arriving at the conclusion.
3.4 RESEARCH DESIGN OF THE STUDY

The present study seeks to measure the effectiveness of multimedia programme in perceiving human anatomy among higher secondary students. The experimental method can be used for this study.

According to Best, John W. (1997), experimental design is the blueprint of the procedures that enable the researcher to test hypothesis by reaching valid conclusions about relationships between independent and dependent variables. In the present study the investigator has followed the experimental group design.

The 52 girl students studying in XI standard biology group (English medium) in Annai Teresa Government Higher Secondary School, Karaikal, were selected for the present study. These students were divided into two equal groups namely control and experimental group, based on the performance in Biology in the half yearly examination by following matched pair technique. Thus the investigator formed equivalent group design. Both control and experimental group students were given pre test for achievement in human anatomy, attitude towards Biology, achievement motivation, attention and perceptive skills, in addition to that, the experimental group students were given pre test for attitude towards multimedia programme to assess their previous knowledge. After that, the control group students were taught through traditional method and experimental group students were taught through multimedia programme separately.
Both groups were taught for about 6 weeks. At the end of the second week, a progress test-I to assess the performance in human anatomy was administered to experimental group students. At the end of the fourth week, a progress test-II to assess the performance in human anatomy was administered to experimental group students. At the end of the treatment, a post test to assess the performance in human anatomy, attitude towards Biology, achievement motivation, attention and perceptive skills was administered to both the control and experimental group students and in addition to that, a post test for attitude towards multimedia programme was administered to experimental group students in order to find out the effectiveness of multimedia programme and its impact on attitude towards Biology, attitude towards multimedia programme, achievement motivation, attention and perceptive skills. The retention test was given to the experimental group students to find the relative retention of learning human anatomy.

Finally the mean scores in the pre-test and post test for achievement in human anatomy, attitude towards Biology, achievement motivation, attention and perceptive skills of both control and experimental group students and the mean scores in the pre test, progress test-I, progress test-II and post test for achievement in human anatomy of the experimental group students and the mean scores in the pre test and post test for attitude towards multimedia programme of the experimental group students were analyzed separately in order to find out the effectiveness of multimedia programme under two different teaching-learning environments.
To find out the high and low achievers of control and experimental group, the mean value for control and experimental group students was calculated as 43 for the performance in Biology in the half yearly examination. The students of above mean value were considered as high achievers and the students of below mean value were considered as low achievers in biology. The students of control and experimental group were divided into high and low achievers based on their performance in biology in the half yearly examination.

The investigator consulted with the experienced teachers who handle the Zoology subject in higher secondary schools in order to finalize the duration of the treatment. On the basis of the suggestions of the above experts, the duration of the treatment was finalized as a period of 6 weeks.

In order to find out the effectiveness of multimedia programme in perceiving human anatomy among higher secondary students, Annai Teresa Government Higher Secondary School, Karaikal, has been selected for the present study based on the availability of computer laboratory facilities and depending upon the availability of English medium biology group.
3.5 PILOT STUDY

A pilot study was conducted in order to ascertain the reliability and validity of the tools constructed and adopted for the present study. For this purpose a sample of 30 students studying XI standard biology group in V.O.C. Government Higher Secondary School, karaikal were selected. The multimedia programme developed by the investigator was presented to the 30 students to check whether the multimedia programme would prove to be effective. The tools constructed by the investigator were also presented to the 30 pilot students to find out their validity and reliability.

3.6 CONSTRUCTION AND VALIDATION OF THE TOOLS

3.6.1 Tools used for the study

1. Development of multimedia programme for human anatomy by the investigator.

2. Achievement test in Human Anatomy (Developed and validated by the investigator)

3. Attitude Scale towards Biology (Developed and validated by the investigator)

4. Attitude Scale towards Multimedia Programme (Developed and validated by the investigator)

5. Achievement Motivation Scale (Beena Shah, 1986)
6. Attention Inventory Scale (Developed and validated by the investigator)

7. Perceptive skills assessment Scale (Developed and validated by the investigator)

3.6.2 Achievement test in Human anatomy

Separate achievement tests were used for the pre test, progress test-I, Progress test-II, post test and retention test to measure the level of achievement in human anatomy. These separate achievement tests were developed by the investigator.

The investigator constructed separate tests for pre test, progress test-I, progress test-II and post test and retention test. Each test was presented before professors of Zoology and teachers who handle the Zoology subject in higher secondary schools. On the basis of the suggestions of the experts, some questions were modified, some were altered, some were rejected and some were included. Finally 50 multiple choice items were selected for each test. The question items were based on the unit of human anatomy from XI standard Zoology subject which was selected for the present study. A copy of the achievement test for pre test, progress test-I, progress test-II, post test and retention test are given in Appendix – I, II, III, IV and V respectively.

Each achievement test was presented to the pilot group of 30 students to find out the validity and reliability of the test.
Each achievement test contains 50 multiple choice questions, each having four answers. The students have to select the best answer from the given alternatives. Each question carries one mark. The time allotted to answer the each achievement test was one hour.

Thus the score value lies between 0-50 (0-100 in percentage) for each test. The content validity of each tool was established based on the opinion given by the experts. The reliability of each tool was established by Split-Half method. It was found to be 0.83, 0.87, 0.85, 0.89, and 0.90 for the pre test, progress test-I, progress test-II, post test and retention test respectively which were significant.

### 3.6.3 Attitude Scale towards Biology

The attitude scale was used to measure the level of attitude towards Biology. The scale was constructed and validated by the investigator.

The attitude scale towards Biology, consisting of 45 items, was designed by the investigator and was given to professors of Zoology and experienced teachers who handle the Zoology subject in higher secondary schools, professors of education and educational psychologists. On the basis of the suggestions of above experts, some items were restructured and some were eliminated. Finally 25 items were selected for this test. A copy of the attitude scale towards Biology is given in Appendix – VI.

The attitude scale towards Biology was presented to the pilot group of 30 students to find out the validity and reliability of the test.
The scale for measuring the higher secondary student’s attitude towards Biology in the study is of the Likert type. This scale has as many as 25 statements of which 20 are favourable towards Biology and the remaining are unfavourable towards it.

**Scoring**

In the Likert type of scale, against each statement, five alternatives namely “Strongly agree”, “Agree”, “Undecided”, “Disagree”, and “Strongly disagree” were given. The subjects have to indicate their choice by putting a tick-mark (√) under one of the five columns against each statement.

For favourable statement weightage of 4,3,2,1 and 0 were given from strongly agree to strongly disagree in that order. For unfavourable statements the scoring was reversed. Thus the strongly agree response will get 0 and the strongly disagree response will get 4. Here the weightage of 0,1,2,3 and 4 were given from strongly agree to the strongly disagree in that order.

Thus the score value lies between 0-100. The content validity of the tool was established based on the opinion given by the experts. The reliability of the tool was established by Split-Half method. It was found to be 0.89 which was significant.
3.6.4 Attitude Scale towards Multimedia Programme

The attitude scale was used to measure the level of attitude towards Multimedia programme. The scale was constructed and validated by the investigator.

The attitude scale towards multimedia programme, consisting of 40 items, was designed by the investigator and was given to experienced teachers who were handling Computer Science in higher secondary schools, professors of Computer Science and Education and Educational psychologists. On the basis of the suggestions of above experts, some items were restructured and some were eliminated. Finally 25 items were selected for this test. A copy of the attitude scale towards multimedia programme is given in Appendix – VII.

The attitude scale towards multimedia programme was presented to the pilot group of 30 students to find out the validity and reliability of the test.

The scale for measuring the higher secondary student’s attitude towards multimedia programme in the study is of the Likert type. This scale has as many as 25 statements of which 20 are favourable towards multimedia programme and the remaining are unfavourable towards it.
Scoring

In the Likert type of scale, against each statement, five alternatives namely “Strongly agree”, “Agree”, “Undecided”, “Disagree”, and “Strongly disagree” are given. The subjects have to indicate their choice by putting a tick-mark (√) under one of the five columns against each statement.

For favourable statements weightage of 4, 3, 2, 1 and 0 were given from strongly agree to strongly disagree in that order. For unfavourable statements the scoring was reversed. Thus the strongly agree response will get 0 and the strongly disagree response will get 4. Here the weightage of 0, 1, 2, 3 and 4 were given from strongly agree to the strongly disagree in that order.

Thus the score value lies between 0-100. The content validity of the tool was established based on the opinion given by the experts. The reliability of the tool was established by Split-Half method. It was found to be 0.83 which was significant.

3.6.5 Achievement Motivation Scale

To measure the level of achievement motivation, the investigator used the Achievement Motivation Scale constructed and validated by Beena Shah (1986).
This scale included 4 dimensions: need for academic success, need for vocational achievement, need for social achievement and need for skill achievement. Each dimension has 10 items. Each item has three alternatives (a,b,c) to choose from. A copy of the Achievement Motivation Scale is given in Appendix – VIII.

The Achievement Motivation Scale was presented to the pilot group of 30 students to find out the validity and reliability of the test.

**Scoring**

The Achievement Motivation Scale is a three point scale, consisting of 40 items. Each statement is followed by three alternative responses. Weightage 1, 2 and 3 are respectively awarded for alternatives (a), (b), (c) irrespective of any statement.

Thus the scale value lies between 40 -120 (33 – 100 in percentage). The validity of the scale was ascertained by content validity. The previous investigator established reliability by Split-Half method and it was found to be 0.60. The present investigator established reliability by Split-Half method and it was found to be 0.82.

**3.6.6 Attention Inventory Scale**

The attention inventory scale was used to measure the level of attention of the students. The scale was constructed and validated by the investigator.
The attention inventory scale, consisting of 30 items, was designed by the investigator and was given to experienced teachers working in higher secondary schools, professors of education and educational psychologists. On the basis of the suggestions of above experts, some items were restructured and some were eliminated. Finally 15 items were selected for this test. A copy of the attention inventory scale is given in Appendix – IX.

The attention inventory scale was presented to the pilot group of 30 students to find out the validity and reliability of the test.

The scale for measuring the higher secondary students’ attention in the study is of the Likert type. The attention inventory scale included 15 items in the form of statement. The items included only positive statements.

**Scoring**

In the Likert type of scale, against each statement, five alternatives namely “Strongly agree”, “Agree”, “Undecided”, “Disagree”, and “Strongly disagree” were given. The subjects have to indicate their choice by putting a tick-mark (√) under one of the five columns against each statement. For each statement, weightage of 4,3,2,1 and 0 were given from strongly agree to strongly disagree in that order.
Thus the score value lies between 0-60 (0-100 in percentage). The content validity of the tool was established based on the opinion given by the experts. The reliability of the tool was established by Split-Half method. It was found to be 0.81 which was significant.

3.6.7 Perceptive skills assessment Scale

To measure the level of perceptive skills of the students, the investigator used the perceptive skills assessment scale.

The perceptive skills assessment scale was constructed and validated by the investigator. The perceptive skills assessment scale was designed by investigator and was given to professors of Zoology, education, educational psychologist and Zoology school teachers who handle the subjects at higher secondary level. Necessary changes were made according to their suggestions. A copy of the perceptive skills assessment scale is given in Appendix – X.

The perceptive skills assessment scale was presented to the pilot group of 30 students to find out the validity and reliability of it.

Scoring

The scale consists of 3 sections. First section is a 5 point scale, consisting of 3 items. Weightage 0,1,2,3,4 were respectively awarded for 5 alternatives (4x3=12). Second section is a 3 point scale, consisting of 3 items. Weightage 0,1,2 were respectively awarded for 3 alternatives
(2x3=6). Third section consists of 7 items. One mark was awarded to the correct answer and 0 to the wrong answer (1x7=7).

Thus the score value lies between 0-25 (0-100 in percentage). The content validity of the tool was established based on the opinion given by the experts. The reliability of the tool was established by Split-Half method. It was found to be 0.89 which was significant.

3.7 DATA COLLECTION

It consists of administration of pre test, implementation of multimedia programme, administration of progress test-I, administration of progress test-II, administration of post test and administration of retention test.

3.7.1 Administration of pre test

The investigator administered the validated test tool to the learners of both the control and the experimental groups. This was to assess their entry behaviour. During the test, effective supervision was provided in order to prevent the exchange of information among the learners. The distance among the learners had been considerably increased.

The Achievement test in human anatomy constructed and validated by the investigator was administered to the subjects of both control and experimental groups in order to assess their entry behaviour. The pre test scores on achievement test were collected.
The Attitude Scale towards Biology was constructed and validated by the investigator and was administered to the subjects of both control and experimental groups. The pre test scores on attitude towards Biology were collected.

The Attitude Scale towards Multimedia Programme was constructed and validated by the investigator and was administered to the subjects of the experimental group. The pre test scores on attitude towards multimedia programme were collected.

The Achievement Motivation Scale (Beena Shah, 1986) was administered to the subjects of both control and experimental groups. The pre test scores on Achievement motivation were collected.

The Attention Inventory Scale, constructed and validated by the investigator, was administered to the subjects of both control and experimental groups. The pre test scores on attention inventory scale were collected.

The Perceptive skills assessment Scale was constructed and validated by the investigator and was administered to the subjects of both control and experimental groups. The pre test scores on perceptive skills were collected.
3.7.2 Implementation of multimedia programme to experimental group

The subjects of the experimental group were allowed to learn human anatomy through multimedia programme for a period of 6 weeks.

3.7.3 Implementation of traditional approach to control group

The subjects of control group were exposed to the traditional method of teaching for a period of 6 weeks.

3.7.4 Administration of progress test-I

The progress test-I for achievement in human anatomy was administered to the subjects of experimental group at the end of the second week. The progress test-I scores were collected.

3.7.5 Administration of progress test-II

The progress test-II for achievement in human anatomy was administered to the subjects of experimental group at the end of the fourth week. The progress test-II scores were collected.

3.7.6 Administration of post test

At the end of the treatment, the post test for achievement in human anatomy, attitude towards Biology, achievement motivation, attention and perceptive skills was administered to the subjects of both control group and
experimental groups and in addition to that, the post test for attitude towards multimedia programme was administered to the subjects of experimental group. The post test scores were collected.

3.7.7 Administration of retention test

Retention test for achievement in human anatomy was administered to the subjects of experimental group at the end of one month of treatment. The retention test scores were collected.

Thus pre test, progress test-I, progress test-II, post test and retention test scores on achievement in human anatomy and pre test and post test scores on attitude towards Biology, attitude towards multimedia programme, achievement motivation, attention and perceptive skills were computed for analysis.

3.8 STATISTICAL TECHNIQUES USED FOR DATA ANALYSIS

In the present study, the relevant data obtained from assessment scores of 52 students on the pre test, progress test-I, progress test-II, post test and retention test on achievement in human anatomy, and pre test and post test scores on attitude towards Biology, attitude towards multimedia programme, achievement motivation, attention and perceptive skills have been analyzed as follows:

The scores on the pre test, progress test-I, progress test-II, post test and retention test on achievement in human anatomy, and pre test and post
test scores on attitude towards Biology, attitude towards multimedia programme, achievement motivation, attention and perceptive skills were converted into percentage.

3.8.1 Descriptive analysis

It provides information about the nature of a particular group of individuals. Mean and Standard deviation were calculated for pre test, progress test-I, progress test-II, post test and retention test on achievement in human anatomy and for pre test and post test on attitude towards Biology, attitude towards multimedia programme, achievement motivation, attention and perceptive skills.

3.8.2 Differential analysis

It provides inferences involving determination of statistical significance of the difference among the students with reference to selected variables namely, pre test, progress test-I, progress test-II, post test and retention test on achievement in human anatomy, pre and post test on attitude towards Biology, attitude towards multimedia programme, achievement motivation, attention and perceptive skills. It involves ‘t’ test for small sample.
3.8.3 Relational analysis

Relational analysis aims at finding out the relationship between two variables. In the present study, product moment correlation was used to find out the significance of the relationship among the variables: performance in human anatomy, attitude towards Biology, attitude towards multimedia programme, achievement motivation, attention and perceptive skills among the experimental group students.

3.9 CONCLUSION

In this chapter, the research methodology followed in the study was explained in detail. The next chapter deals with the development of multimedia programme for human anatomy.