Chapter III

METHODOLOGY

In this chapter, purpose of the study, selection of subjects, development of multimedia courseware, construction of tool, item analysis, test item difficulty, test item discriminating power, reliability of the tool, validity of the tool, scoring procedure, administration of the multimedia courseware, administration of questionnaire and experimental design and statistical procedure were explained.

Purpose of the Study

The purpose of the study was to develop Multimedia Courseware in teaching Kinesiology for Physical Education major. The study consists of two parts. The first part of the study was to develop multimedia courseware in teaching selected units of Kinesiology for physical education major and the second part of the study was to find out the effectiveness of developed multimedia courseware.

Selection of Subjects

To achieve the purpose of the study, twenty students from Dr.Sivanthi Aditanar College of Physical Education, Tiruchendur, Tamil Nadu studying Masters Degree course in Physical Education,
were randomly selected by lot method as subjects. The age of the subjects ranged from 22 to 25 years. The selected subjects had basic knowledge about the computer because they had studied in their curriculum.

**Selection of Content for Courseware Designing**

Human beings are more arguably the most complex organisms on this planet. Imagine billions of microscopic parts, each with its own identity, working together in an organized manner for the benefit. It is a structure but it is made up of billions of smaller structures of four major kinds, which are cells, tissues, organs and systems. Among the above four, systems are most complex units of the human body. A system is an organization of varying numbers and kinds of organs so arranged that together they can perform complex functions for the body. Ten major systems compose the human body such as Skeletal, Muscular, Nervous, Endocrine, Cardiovascular, Lymphatic, Respiratory, Digestive, Urinary and Reproductive Systems.

The knowledge of the kinesiology would open up many new paths in the exercise training and fitness. A physical activity begins with the movement of the individual. Movements depends with muscle and joints in a coordinated manner. Hence, muscles and
joints in upper extremities in kinesiology were selected for this study to develop the multimedia based courseware.

**Selection of Variables**

The learning achievement and attitude of students towards the courseware were selected as a dependent variables and it was measured through the researcher developed questionnaire namely Learning Achievement Test and Attitude scale toward multimedia courseware respectively. The experimental group attended the multimedia courseware on kinesiology and they were tested before and after treatment for the levels of knowledge.

The researcher developed the multimedia courseware for the selected units in kinesiology. Hence, multimedia courseware teaching was selected as independent variables.

**Development of Multimedia Courseware**

Since a multimedia courseware would be incomplete without the application of computer software, an earnest attempt was made to develop computer courseware. A computer expert was consulted for this purpose and it was discussed with him how to develop multimedia based teaching courseware. The investigator was taken every possible effort to develop multimedia courseware along with the expert in computer programming. The investigator and the
subject experts were duly consulted in the editing process. After a thorough and meticulous editing, the Compact Disc was made ready for instructional presentation to the selected students in physical education. The multimedia courseware was prepared in such a way that it ensured the following.

1) Letting students work at their own pace.

2) Measuring performance quickly and giving students information on their performance.

After this, the multimedia courseware programme was made ready for the use of the students in physical education. The detailed information about the development of multimedia courseware in selected units of Kinesiology has been outlined in Chapter IV. The prepared courseware is also attached in the form of a CD-ROM for the reference of the reader.

**Construction of Learning Achievement Tool**

A tool was constructed to evaluate the effectiveness of multimedia courseware and to compare the learning achievement of the students through multimedia based courseware in Kinesiology. The questionnaire was constructed covering all the units chosen for this study. Equal weightage was given to each unit.
Questions of objective type were framed without omitting any unit. Multiple choice and fill in the blanks were the types of questions used in this learning achievement test. The questions were framed to suit the understanding level of Masters Degree students in physical education. Utmost care was taken to avoid ambiguity and ambivalences. Item analysis was done to finalize the questions.

Initially 90 questions of objective type in nature were framed for tryouts. Sixty percent multiple choice question items and 40 percent fill in the blanks items were framed as contents of the questionnaire. Multiple choice test items were composed of a stem followed by a set of four options including possible responses or distracters. The stem is a direct question or an incomplete statement with four options of which only one is the correct response. Due importance and weightage are given to multiple choice-test items because its level of difficulty can be varied with relative ease and it is capable of reflecting simple student behavioural patterns such as recall of information as well as complex student behavioural as patterns such as the ability to analyze and synthesize.

Fill in the blank test items constitute 40 percent of the achievement test items. These test items are questions or incomplete
statement which requires highly short and specific answers. The answer is usually a significant word or expression.

**Item Analysis**

After pooling of 90 test items, the framed test items were subjected to careful scrutiny and critical judgment by a panel of subject experts. Each item was critically examined for what might be termed “formal defects”. The next stage was tried out; the whole pool of items was given as a test to twenty students belonging to the target population. The obtained data were then used for an elaborate set of statistical procedures known as item analysis, which gave the investigator information regarding. *(Robert, 2004)*

1. Item difficulty

2. Item discrimination and

3. Error or distraction analysis

**Test Item Difficulty**

Test item difficulty refers to the percentage of students who correctly answered to a given test item. The level of difficulty was determined by using the formula

\[ P = \frac{N_r}{N_t} \times 100 \]

Where,
P = Percentage of students who answered the test item correctly

N_r = Number of students who answered the test item correctly

N_t = Total number of students who attempted to answer the test item

In most of the cases the percentage clustered around the 50 percent level. On the basis of this analysis, too easy and too difficult test items were deleted in the final form of achievement test.

**Test Item Discriminating Power**

A test item possesses adequate discriminating power when it is capable of differentiating between superior and inferior students. To determine item discriminating power the following simple formula was used even though there are many different computational schemes

\[
D = \frac{U - L}{N}
\]

Where,

D = Index of item discriminating power.

U = Number of students in the upper group who answer the test item correctly (usually 27% of the total group).
L = Number of students in the lower group who answer the test items correctly (usually 27% of the group).

N = Number of students in each group.

For more than fifty percent of the test items, the computed D value exceeded + 0.4 which indicated that the test items were good and for the remaining items, the computed ‘D’ value ranged between +0.40 and +0.20 which was a clear indication to the satisfactory condition of the test item. Those items which failed to differentiate between the superior and the inferior students were not included in the final form of achievement test.

Each item was scored ‘one’ mark for the correct response and ‘zero’ mark for the wrong response. The duration of the test was one and half hours.

**Reliability of Learning Achievement Tool**

A pilot test was made administering the test to ten students belonging to the target population. The main purpose of the pilot study was to establish the reliability of the achievement test. The scores obtained by the students in the pilot study formed the basis for establishing reliability of the test.

The test reliability means the consistency with which a set of test scores measures what they do measure. It relates to the
accuracy with which skills and knowledge are measured. Reliability is a necessary condition for validity. Reliability coefficient provides the most revealing statistical index of validity that is ordinarily available. There are different methods to estimate the reliability of a test. Some of the commonly used methods are:

- Test-retest reliability
- Split half reliability
- Alternative parallel form reliability and
- Kuder – Richardson estimates

In the present study, the split half method is used to estimate the reliability of the test. The split half method is considered to be one of the best methods for measuring reliability because all the data for computing reliability are obtained by one testing. Also, the variations likely to be brought about by difference between the two testing situations are eliminated.

The test was conducted to ten Masters Degree students. In this method, the test items were divided into two equivalent halves by pooling the scores on odd numbered items and then pooling the scores on even numbered items, and the correction was found for these half tests by using the Karl Pearson’s correlation coefficient (the obtained ‘r’ value was 0.78).
Validity of Learning Achievement Tool

A research tool is said to be valid when it measures what it purports to measure. Any achievement test should possess validity. Validity indicates how adequately the content of the test is sampling that domain about which inferences are to be made. It is particularly very important for achievement test.

Face validity (or) Faith validity

Face validity is best restricted to the fact that a test ‘Looks’ valid, particularly to those which are unsophisticated, in test practices. By using this validity measures, researches can have little confidence, because it expresses the resemblances of what the researches has in mind or what be things to measures through question. A more scientifically and professionally justifiable reason for face validity is to make it palatable to the examinee. If the judgment of face validity has utilization value in helping the researcher to decide whether the items of the questionnaire are relevant to some specific situation, he should be likely to have increased motivation in taking it and uniformly high motivation is an important testing condition. In the present study, the research questionnaire developed by the investigator aimed at measuring what the researches thought in this mind. The investigator thought that the items of the tools measured the three aspects such as
kinesiology, muscles and joints in upper extremities. Therefore, it is decided that the tools process face validity.

**Content Validity**

Content validity is a type of test validity in which the content if a test is judged to be representative of a larger domain of content. Nunnally (1978) observes that rather than establishing the validity of measures after their construction, it is more meaningful that are should ensure the validity of a tool by the plan and procedure of the test construction. According to him, there are two major steels for ensuring content validity they are,

1. A representative collection of item and

In developing the tools for the present study, the above standard guidelines are followed. The different procedures employed in the tool construction are adequately outlined in this chapter under the caption. In the light of the procedures adopted the developing in the questionnaire, if can confidently be said that the tools have sufficient content validity.
SCORING PROCEDURE FOR LEARNING ACHIEVEMENT TOOL

The achievement test questionnaire constructed by the investigator was used to collect data from the learners of the multimedia courseware. The responses given by the students in the test formed the vital data required for the analysis. The achievement test consisted of forty five questions. Out of forty five questions, thirty objective type questions and fifteen fill in the blanks type questions were present. The total score of the test was forty five. For each correct answer, the score was one, and for each wrong answer the score was zero.

Attitude Scale

The attitude scale was constructed by the researcher to measure the student attitude towards using the computer and multimedia courseware and it was administered after the subjects completed the multimedia courseware. The tool contains 20 items (Computer -10 and Multimedia Courseware -10) comprising a five point scale that measure the attitude of the students about the computer and multimedia courseware. The subject has to select and tick in one of the five columns following: ‘strongly disagree’, ‘disagree’, ‘neutral’, ‘agree’ and ‘strongly agree’. The scores for each item were assigned as strongly disagree-1, disagree-2, neutral-3,
agree-4 and strongly agree-5 respectively. The total score of the attitude scale is 100.

**Administration of Multimedia Courseware**

The students were taught through multimedia-based courseware for a period of fifteen working days at the rate of one hour per day. The students were taught individually by using computers with multimedia courseware. Three units were covered in the period of investigation. The students were asked to make self study with the help of the multimedia courseware. All the units in the courseware were arranged in sequential order. The students were not allowed to use the handbook to home.

For conducting the experiments, the computer laboratory in Dr. Sivanthi Aditanar College of Physical Education, Tiruchendur was used. Since, multimedia courseware had a motivating quality of its own, due to the provisions for interaction by students; the learners were very much attracted to it. The provision for knowledge of result, immediate feedback and reinforcement found in the programme made their learning exciting and pleasant. The diagrams and the sketches which were incorporated in addition to the text and table the courseware, made good visual impact which, in turn, contributed for better understanding and longer retention.
Administration of the Questionnaire

The learning achievement test questionnaire constructed by the investigator was administered to the learners of the multimedia courseware. The subjects were tested thrice. Pre test was arranged before the administration of multimedia courseware, the post-test I was conducted after nine days and post-test II was done after fifteen days on the completion of courseware. The responses given by the students in the test formed the vital data required for the analysis. The achievement test consisted of forty five questions. The total score of the test was forty five. For each correct answer, the score was one and for each wrong answer the score was zero. Along with the achievement test questionnaire, the student’s attitude or response towards the multimedia courseware was also collected and it was subjected to the descriptive analysis.

Experimental Design and Statistical Procedures

The pre and post-test random group design was used as experimental design. The data pertaining to this study were examined by using one way analysis of variance (ANOVA) with repeated measures for the variables in order to determine the differences if any among the means of three tests. Whenever ‘F’ ratio was found to be significant, the Scheffe’s test was used as post-hoc test to determine which of the paired mean differ
significantly. Descriptive statistics was also used to analyze the attitude of students towards the multimedia courseware and using computer. The level of significance was fixed at 0.05 level of confidence for all the cases.