CHAPTER – III

METHODOLOGY

3.1 INTRODUCTION

After the review of related literature previous researches, this chapter deals with the methodology used in this study. This chapter deals with the design of the study, tools used for the study, sample selected, experimental procedure, variables used and statistical techniques used.

According to Best, J.W. (1997), “Research is considered to be more formal, systematic and intensive process of carrying on the scientific method of analysis. It involves a more systematic structure of investigation usually resulting in some sort of formal record of procedure and a report of results in conclusion”.

The present study was intended to find out the “Effect of Multimedia Approach on Knowledge and Skills in and Attitude of Students towards Science at Upper Primary Level”. In this chapter the methodology of the study is presented under three major sections as:

Section A: Design of the Study
Section B: Tools Used for the Study
Section C: Selection of sample and Experimental Procedure
SECTION – A

This section has in detail the layout or the Design of the study, variables, objectives and Hypotheses.

3.2 DESIGN OF THE STUDY

The layout or the design of the study reveals the various stages of development of the Multimedia Approach the experimental phase, administration of the post-test and the comparison of results.

A diagrammatic representation of the Design of the Study is given in Figure 3.1.

Figure 3.1: Diagrammatic representation of the design of the study
The equivalent pre-test post design has been selected as the design for the present study which explained as follows.

3.2.1 Design Selected

The equivalent pre test post test design has been selected as the particular experimental design for the study. In this design there would be one Experimental group and one Control group. Both the groups will receive pre test and post test.

3.3 SAMPLE

VII Standard students of Upper Primary Level were considered as the population for the present study. As it is an experimental study. It was difficult to collect data from a large sample. Therefore, only one CBSE school of Kerala state was selected for the conduct of the experiment. Two sections of VII standard containing 50 students in each division are taken as sample treating one division as Experimental group and the other Control group randomly.

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Figure 3.2: Flow chart showing the selection and distribution of sample
Actual number of students in the Experimental and Control groups are shown in Table 3.1.

**Table 3.1: Number of Boys and Girls in Experimental Group and Control Group**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>31</td>
<td>22</td>
<td>53</td>
</tr>
<tr>
<td>Girls</td>
<td>19</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

The Experimental group was taught through Multimedia Approach and Control group was taught through Conventional method.

**3.4 SELECTION OF THE TOPIC**

The topics for treatment in the present study have been selected from the syllabus prescribed for standard VII students of CBSE for the academic year 2011-2012. The investigator thoroughly reviewed the science text book of VII Standard for selecting the topics. Six chapters were selected which were found suitable for teaching through MMA and Conventional method of teaching. They are:

- Chapter VII  Weather, Climate and Adaptations of Animals to Climate
- Chapter VIII Wind, Storms and Cyclone
- Chapter IX  Soil
- Chapter X   Respiration in Organisms
- Chapter XI  Transportation in Animals and Plants
- Chapter XII Reproduction in Plants
3.5 VARIABLES OF THE STUDY

The present study is “Effect of Multimedia Approach on Knowledge and Skills in and Attitude of Students towards Science at Upper Primary Level.” The details of the variables of the study are described below:

3.5.1 Dependent Variables

- Achievement of Knowledge in science
- Attainment of Skills in Science
- Attitude towards Science

These are treated as the dependent variables.

3.5.2 Independent Variable

- Multimedia Approach (MMA)

Learning through MMA by the experimental group learners and learning through the conventional class room teaching by the control group learners are treated as independent variables for the present study.

3.6 OBJECTIVES OF THE STUDY

The objectives formulated for the present study are the following.

1. To develop Instructional Materials based on Multimedia Approach in Science at Upper Primary Level for developing Knowledge, Skills and Attitude.

2. To study the effectiveness of Multimedia Approach over the Conventional Method in Science at Upper Primary Level for developing Knowledge, Skills and Attitude.

3. To study the gender differential effectiveness of Multimedia Approach and Conventional Method in Science at Upper Primary Level for developing Knowledge, Skills and Attitude.
3.7 HYPOTHESES OF THE STUDY

The hypotheses formulated on the basis of the objectives are given below.

1. The students exposed to MMA will have greater achievement in Science than the Conventional Method at Upper Primary Level in terms of Knowledge.

2. The students exposed to MMA will have greater achievement in Science than the Conventional Method at Upper Primary Level in terms of Skills.

3. The students exposed to MMA will have greater Attitude towards Science than the Conventional Method at Upper Primary Level.

4. The effect of MMA and Conventional Method in Science will be different on boys and girls at Upper Primary Level in terms of development of Knowledge.

5. The effect of MMA and Conventional Method in Science will be different on boys and girls at Upper Primary Level in terms of development of Skills.

6. The effect of MMA and Conventional Method will be different among boys and girls at Upper Primary Level with respect to Attitude towards Science.
SECTION – B

3.8 TOOLS USED FOR THE STUDY

This section elucidates the tools used for the present study. This various tools used for the study are:

I. Achievement Test
II. Attitude Scale
III. MMA
IV. Conventional Classroom Teaching

The description of each of the tools is given below.

3.8.1 Achievement Test

The tool is prepared for measuring the level of the students with regard to their knowledge and skills in science.

The answer to each question was evaluated by giving scores 1 for each correct response and 0 for wrong answer.

Achievement Test in Science

An Achievement test in Science has been prepared by the investigator on the topics selected for treatment. The present test is based on the Taxonomy of Educational Objectives suggested by Bloom (1979). This test was used as the pre-test and the posttest in this study. The procedure adopted for the construction of Achievement Test in Science is described in the following section.

a. Planning of the Test

The curriculum, syllabus and text book of science for Standard VII students for the academic year 2011–2012 have been thoroughly studied by the investigator. Also, the investigator consulted with experienced teachers in science for guidance. Moreover, following books have been referred for framing items for the test.
1. Constructing Achievement Tests (Gronlund, 1968)
3. Taxonomy of Educational Objectives (Bloom, 1979)
4. Essential of Educational Measurement (Ebel and Frisbia, 1991)

It was decided that the test will consist of 50 multiple choice items. The duration of the test has been fixed for 60 minutes. The maximum marks fixed for the test is 50.

b. Preparation of the Test

Items for the Achievement Test in Science have been prepared on the basis of the major objectives in the cognitive domain namely, knowledge.

In the preparation of the test, due weightage has been given to the objectives, content and difficulty level.

Weightage to Objectives

The weightage given to difference objectives for Achievement Test is given in Table 3.2.

Table 3.2: Weightage to Objectives

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Objectives</th>
<th>No. of Questions</th>
<th>Marks</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Remembering</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>2.</td>
<td>Understanding</td>
<td>18</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>3.</td>
<td>Applying</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>4.</td>
<td>Analyzing</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>5.</td>
<td>Creating</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>Evaluating</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Weightage to Content

After a thorough analysis of the six chapters, adequate weightage have been given for each unit. The weightage given is presented in Table 3.3.

Table 3.3: Weightage to Content

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Objectives</th>
<th>No. of Questions</th>
<th>Marks</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Weather, climate and Adaptations of Animals to Climate</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>2.</td>
<td>Wind, Storms and Cyclones</td>
<td>8</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>Soil</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>4.</td>
<td>Respiration in organisms</td>
<td>9</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>5.</td>
<td>Transportation in animals and plants</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>6.</td>
<td>Reproduction in plants</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Weightage to Difficulty Level

The weightage given to the three levels of difficulty for the Achievement test is given in Table 3.4.

Table 3.4: Weightage to Difficulty Level

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Objectives</th>
<th>No. of Questions</th>
<th>Marks</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Easy</td>
<td>14</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>2.</td>
<td>Average</td>
<td>29</td>
<td>29</td>
<td>58</td>
</tr>
<tr>
<td>3.</td>
<td>Difficult</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Blue Print

A blue print specifying to the content covered by the test in relation to the weightage assigned for different objectives has been prepared by the investigator. The
items for the draft test have been prepared on the basis of this blue print. The blue print for the final test is presented in Table 3.5.

**Table 3.5: Blue Print for Achievement Test in Science**

<table>
<thead>
<tr>
<th>Content</th>
<th>Objectives</th>
<th>Remembering</th>
<th>Understanding</th>
<th>Applying</th>
<th>Analyzing</th>
<th>Creating</th>
<th>Evaluating</th>
<th>Total No. of Questions</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather, Climate and adaptations of animals to climate,</td>
<td></td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>--</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Wind, Storms and cyclones</td>
<td></td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Soil</td>
<td></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Respiration in organisms</td>
<td></td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Transportation in Animals and Plants</td>
<td></td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>--</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Reproduction in plants</td>
<td></td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>--</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Total No. of Questions</td>
<td></td>
<td>15</td>
<td>18</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>50</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td></td>
<td><strong>15</strong></td>
<td><strong>18</strong></td>
<td><strong>7</strong></td>
<td><strong>6</strong></td>
<td><strong>1</strong></td>
<td><strong>3</strong></td>
<td><strong>50</strong></td>
<td></td>
</tr>
</tbody>
</table>

Based on the blue print, 60 items have been prepared by the investigator. Out of the 60 items, 45 items were testing the Knowledge and 15 items for Skills. All items were prepared, giving, due weightage to six instructional objectives. The Knowledge items and Skill items were get separated and separate tests were conducted for Knowledge and Skills. The answers for the multiple choice items can be selected from the given four alternatives, separate response sheets were also given to the students for Knowledge test and test for Skill items. Standardization of the
Achievement Tests in Science was done by the investigator, before final data collection.

**The Try Out**

After preparation of 60 questions for try out the draft test has been presented to a panel of experts for scrutiny. After scrutiny, suggestion at a test has been tried out by the investigator on a representative sample of 60 students in two divisions of Standard VII other than the Experimental and Control group were selected. Before the administration of the test, the purpose of the test was made clear to the students. The draft test materials with a response sheet were provided to the students. The test materials included all the necessary guidelines about the tests and additional information needed were given by the investigator. All the 60 items in the response sheets were scored as per scoring key.

**ITEM ANALYSIS**

The procedure suggested by Ebel and Frisbie (1991) was employed for item analysis. The selected response sheets were arranged in the descending order of the magnitude of scores. The scores obtained by the upper 15 subjects and lower 15 subjects were taken as the upper group and lower group respectively. For the selection of the items in the final test, the difficulty index and discriminating power of each item was found out.

**Difficulty Index**

The difficulty index of an item is considered as the percentage of the group to which the subjects have given the correct response that is, the larger the index, the easier the item. The following formula suggested by Ebel and Frisbie (1991) was employed to calculate the difficulty index of each item.
Difficulty Index = \frac{U + L}{2N}

Where,

U = The number of correct responses in the upper group

L = The number of correct responses in the lower group

N = The number of subjects in each group

**Discriminating Power**

The higher the average discrimination index for items in a test, the more variables the scores are likely to be and the more reliable the scores are expected to be (Ebel and Frisbie, 1991) Formula used for calculating the discriminating power of each item is as follows.

\[
\text{Discriminating Power} = \frac{U - L}{N}
\]

Where,

U = The number of correct responses in the upper group

L = The number of correct responses in the lower group

N = The number of subjects in each group

The difficulty index and discriminating power of each item are given in Table 3.6.
Table 3.6: Difficulty Index and Discriminating Power of 60 items of Achievement Test in Science for Standard VII Students

<table>
<thead>
<tr>
<th>Item No.</th>
<th>U</th>
<th>L</th>
<th>DL</th>
<th>DP</th>
<th>Item selected</th>
<th>Item No.</th>
<th>U</th>
<th>L</th>
<th>DL</th>
<th>DP</th>
<th>Item selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>41</td>
<td>0.57</td>
<td>0.85</td>
<td>*</td>
<td>31</td>
<td>34</td>
<td>17</td>
<td>0.39</td>
<td>0.13</td>
<td>omitted</td>
</tr>
<tr>
<td>2</td>
<td>42</td>
<td>24</td>
<td>0.61</td>
<td>0.77</td>
<td>*</td>
<td>32</td>
<td>33</td>
<td>14</td>
<td>0.39</td>
<td>0.78</td>
<td>*</td>
</tr>
<tr>
<td>3</td>
<td>47</td>
<td>34</td>
<td>0.26</td>
<td>0.51</td>
<td>*</td>
<td>33</td>
<td>26</td>
<td>13</td>
<td>0.37</td>
<td>0.74</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>43</td>
<td>21</td>
<td>0.31</td>
<td>0.56</td>
<td>*</td>
<td>34</td>
<td>31</td>
<td>16</td>
<td>0.52</td>
<td>0.67</td>
<td>*</td>
</tr>
<tr>
<td>5</td>
<td>42</td>
<td>18</td>
<td>0.46</td>
<td>0.85</td>
<td>*</td>
<td>35</td>
<td>9</td>
<td>9</td>
<td>0.17</td>
<td>0.12</td>
<td>omitted</td>
</tr>
<tr>
<td>6</td>
<td>42</td>
<td>24</td>
<td>0.33</td>
<td>0.59</td>
<td>*</td>
<td>36</td>
<td>32</td>
<td>9</td>
<td>0.50</td>
<td>0.85</td>
<td>*</td>
</tr>
<tr>
<td>7</td>
<td>29</td>
<td>11</td>
<td>0.39</td>
<td>0.40</td>
<td>*</td>
<td>37</td>
<td>29</td>
<td>11</td>
<td>0.50</td>
<td>0.85</td>
<td>*</td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>7</td>
<td>0.31</td>
<td>0.56</td>
<td>*</td>
<td>38</td>
<td>32</td>
<td>6</td>
<td>0.37</td>
<td>0.74</td>
<td>*</td>
</tr>
<tr>
<td>9</td>
<td>38</td>
<td>18</td>
<td>0.48</td>
<td>0.67</td>
<td>*</td>
<td>39</td>
<td>29</td>
<td>9</td>
<td>0.38</td>
<td>0.78</td>
<td>*</td>
</tr>
<tr>
<td>10</td>
<td>26</td>
<td>23</td>
<td>0.46</td>
<td>0.06</td>
<td>omitted</td>
<td>40</td>
<td>27</td>
<td>8</td>
<td>0.35</td>
<td>0.70</td>
<td>*</td>
</tr>
<tr>
<td>11</td>
<td>41</td>
<td>22</td>
<td>0.39</td>
<td>0.78</td>
<td>*</td>
<td>41</td>
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<td>0.55</td>
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<td>13</td>
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<td>0.89</td>
<td>*</td>
</tr>
<tr>
<td>13</td>
<td>19</td>
<td>9</td>
<td>0.26</td>
<td>0.17</td>
<td>omitted</td>
<td>43</td>
<td>22</td>
<td>8</td>
<td>0.37</td>
<td>0.74</td>
<td>*</td>
</tr>
<tr>
<td>14</td>
<td>30</td>
<td>12</td>
<td>0.37</td>
<td>0.44</td>
<td>*</td>
<td>44</td>
<td>26</td>
<td>15</td>
<td>0.39</td>
<td>0.21</td>
<td>omitted</td>
</tr>
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<td>15</td>
<td>34</td>
<td>17</td>
<td>0.46</td>
<td>0.77</td>
<td>*</td>
<td>45</td>
<td>13</td>
<td>9</td>
<td>0.21</td>
<td>0.08</td>
<td>omitted</td>
</tr>
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<td>16</td>
<td>42</td>
<td>27</td>
<td>0.39</td>
<td>0.70</td>
<td>*</td>
<td>46</td>
<td>23</td>
<td>7</td>
<td>0.37</td>
<td>0.74</td>
<td>*</td>
</tr>
<tr>
<td>17</td>
<td>20</td>
<td>13</td>
<td>0.31</td>
<td>0.13</td>
<td>omitted</td>
<td>47</td>
<td>31</td>
<td>12</td>
<td>0.37</td>
<td>0.74</td>
<td>*</td>
</tr>
<tr>
<td>18</td>
<td>37</td>
<td>11</td>
<td>0.48</td>
<td>0.62</td>
<td>*</td>
<td>48</td>
<td>24</td>
<td>20</td>
<td>0.44</td>
<td>0.67</td>
<td>*</td>
</tr>
<tr>
<td>19</td>
<td>41</td>
<td>14</td>
<td>0.62</td>
<td>0.59</td>
<td>*</td>
<td>49</td>
<td>41</td>
<td>14</td>
<td>0.53</td>
<td>0.78</td>
<td>*</td>
</tr>
<tr>
<td>20</td>
<td>42</td>
<td>20</td>
<td>0.56</td>
<td>0.67</td>
<td>*</td>
<td>50</td>
<td>33</td>
<td>18</td>
<td>0.39</td>
<td>0.78</td>
<td>*</td>
</tr>
<tr>
<td>21</td>
<td>35</td>
<td>12</td>
<td>0.38</td>
<td>0.47</td>
<td>*</td>
<td>51</td>
<td>35</td>
<td>13</td>
<td>0.35</td>
<td>0.63</td>
<td>*</td>
</tr>
<tr>
<td>22</td>
<td>27</td>
<td>9</td>
<td>0.42</td>
<td>0.63</td>
<td>*</td>
<td>52</td>
<td>34</td>
<td>17</td>
<td>0.57</td>
<td>0.56</td>
<td>*</td>
</tr>
<tr>
<td>23</td>
<td>22</td>
<td>8</td>
<td>0.31</td>
<td>0.62</td>
<td>*</td>
<td>53</td>
<td>30</td>
<td>12</td>
<td>0.33</td>
<td>0.67</td>
<td>*</td>
</tr>
<tr>
<td>24</td>
<td>34</td>
<td>20</td>
<td>0.33</td>
<td>0.67</td>
<td>*</td>
<td>54</td>
<td>25</td>
<td>9</td>
<td>0.32</td>
<td>0.20</td>
<td>omitted</td>
</tr>
<tr>
<td>25</td>
<td>42</td>
<td>21</td>
<td>0.56</td>
<td>0.59</td>
<td>*</td>
<td>55</td>
<td>38</td>
<td>18</td>
<td>0.46</td>
<td>0.34</td>
<td>*</td>
</tr>
<tr>
<td>26</td>
<td>23</td>
<td>7</td>
<td>0.52</td>
<td>0.59</td>
<td>*</td>
<td>56</td>
<td>37</td>
<td>11</td>
<td>0.26</td>
<td>0.52</td>
<td>*</td>
</tr>
<tr>
<td>27</td>
<td>33</td>
<td>18</td>
<td>0.37</td>
<td>0.74</td>
<td>*</td>
<td>57</td>
<td>42</td>
<td>24</td>
<td>0.37</td>
<td>0.53</td>
<td>*</td>
</tr>
<tr>
<td>28</td>
<td>38</td>
<td>12</td>
<td>0.33</td>
<td>0.67</td>
<td>*</td>
<td>58</td>
<td>47</td>
<td>34</td>
<td>0.76</td>
<td>0.25</td>
<td>*</td>
</tr>
<tr>
<td>29</td>
<td>31</td>
<td>13</td>
<td>0.48</td>
<td>0.81</td>
<td>*</td>
<td>59</td>
<td>18</td>
<td>8</td>
<td>0.26</td>
<td>0.52</td>
<td>*</td>
</tr>
<tr>
<td>30</td>
<td>21</td>
<td>19</td>
<td>0.39</td>
<td>0.78</td>
<td>*</td>
<td>60</td>
<td>31</td>
<td>12</td>
<td>0.44</td>
<td>0.74</td>
<td>*</td>
</tr>
</tbody>
</table>

U = Number of correct responses in Upper group  
L = Number of correct responses in Lower group  
DL = Difficulty index of the item  
DP = Discriminating power of the item
The investigator decided to select from the total items of draft test, item having discriminating power more than 0.4 and difficulty index between 0.4 and 0.6 initially. When adequate number of items were not available the investigator considered the item having discriminating power 0.27 and above with difficulty index in between 0.29 and 0.72 for selection and to be included the final test. There were 50 items in the final test. After finalising the 50 items the investigator separated the 40 Knowledge items and 10 Skill items and gave two separate response sheets for marking their responses. The time duration fixed for the test was 50 minutes and the maximum score was 50. The Achievement tests, their response sheets and scoring keys are given in Appendices I and II.

3.8.1.1 Validity of the Test

There are various methods of estimating validity of a measuring instrument. The following types of validity were established for the Achievement Test.

Content Validity

Content Validity was estimated by evaluating the relevance of the test item individually and as a whole (Freeman, 1976) content validity is most appropriately allied only to tests of proficiency and educational achievement. This type of test is designed to measure how well the individual has mastered a specific skill or course of the study. The investigator subjected the test items for expert’s evaluation. As per the expert’s evaluation, the test content covers the significant concepts and is comprehensive enough in terms of the instructional objectives. Thus the content validity of the Achievement Test knowledge and skill test in science was established.

Face Validity

To establish face validity, items of test was subjected to expert’s evaluation. The experts confirmed that the items were able to measure the knowledge and skill in science of Standard VII student.
Criterion Related Validity

To estimate the criterion related validity of the test, criterion related technique was used. The final test was administered on a representative sample of 50 students in one division of Standard VII other than the experimental and control subjects were selected. The response sheets were collected and scored. The second term examination marks in the same subject (Science) of the same sample were collected. Then the Pearson’s Product Moment Correlation co-efficient of the two sets of scores was calculated to find out the validity of the achievement test (Knowledge and Skill). The co-efficient of correlation was found to be 0.65. It indicates that the test is a substantially valid tool to measure the Knowledge and Skill test in Biology.

3.8.1.2 Reliability of the Test

Split half method was applied to calculate the reliability of the test. The score of the odd and even numbered items were correlated using Pearson’s formula of Product Moment Correlation (Garrett, 2004). There were 25 items in each half. For this purpose the test was administered on a representative sample of 50 students and the scores this obtained were utilized for studying the reliability of the test.

The formula to find the Product Moment Correlation is

\[
R = \frac{N \Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{N \Sigma x^2 - (\Sigma x)^2 N \Sigma y^2 - (\Sigma y)^2}}
\]

Where,

\( \Sigma x \) = Total score for first half items
\( \Sigma y \) = Total score for second half items
\( N \) = Number of students

This gave the reliability of the half test. The reliability of the half test thus was 0.69. This was correlated for full length of the test by using Spearman Brown Properhecy formula (Best and Kahn, 2006).
The reliability thus obtained was 0.82.

3.8.2 Attitude Scale in Science: Rationale

For the selection of variables of the study, the investigator went through the related literature, thesis and catalogue of Psychological test to locate a tool to measure the Attitude towards of students of standard VII.

To measure the Attitude towards science, the investigator decided to construct a tool for the present study. As assessment of opinions and actions was required for the measurement of Attitude towards science, the investigator found the rating scale as the most appropriate for constructing the tool.

“A rating scale in a term applied to the expression of an opinion or judgment regarding some situations, objects or character”.

— Barr, Davis and Johnson (1993)

Attitude towards science is nothing but a condition of readiness for a certain type of activity. It requires consistent, systematic, thinking, stubborn determination and to take nothing for granted. Systematic thinking requires training. It is an acquired ability.

The scale exceeds all psychological measurement methods that depend upon human judgment for its use and its case measurement, various scaling techniques have led to the development of different types of rating scales, which provide a quick and convenient measure of individuals feelings. It involves qualitative description of aspects of a thing.
Construction of Attitude Scale towards Science

For constructing an attitude scale generally we use the following methods.

1. Thurston’s scale
2. Likert’s scale
3. Guttman’s scale
4. Bogardus’s social distance scale

First two types are generally used in Educational researches. In the present investigation, Likert’s method of summated rating was used.

Likert Scale

The investigator has taken the following steps to construct Attitude scale.

- Deciding the universe of content
- Construction of items
- Preparation of the initial draft
- Evaluation of the initial draft
- Preparation of the second draft
- Validation of the scientific attitude scale
- Preparation of final draft
- Method of scoring

The construction of a tool is always to decide about the areas, which are the content to be measured. In the present investigation for the purpose of deciding this universe of content, the available research on science education were studied.

The investigator selected 6 measures of Attitude towards science for the present study. They are,

1. Learning Science in School
2. Self Concept in Science
3. Practical work in Science
4. Science outside the school

5. Future Participation in Science

6. Importance of Science

a) Construction of items

Items were constructed considering the following suggestions.

- Items were constructed on the basis of daily life situation related to school, home and society.
- Almost equal numbers of positive and negative items were prepared.
- Almost equal numbers of items were constructed under each measure.
- Items were written in simple, clear and direct language.
- Items containing universals such as strongly agree, agree, undecided, disagree, strongly disagree were considered.

The investigator prepared an initial draft of 50 items. Items were prepared under each Attitude measure. An equal weightage was given to both positive and negative statements. A five point scale was prepared to avoid central tendency effect.

Out of fifty items prepared 35 items were selected on the basis of clarity and specify, the selected items were arranged under each measure. Details regarding the personal information of the respondent were drafted.

The initial draft of the tool was submitted to the supervisor for evaluation. Based on the suggestions given by them, the statements were made concise and the items were made more specific. This draft was submitted to experts in the field of education for validation.

Each item of the tool was examined by the experts for content validity. After the examination by the experts, the corrections and opinions were implemented in the final draft of the tool.
Table 3.7: Distribution of the measures of Attitude in the Attitude Scale towards Science

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Measures of Attitude</th>
<th>+ve Statements</th>
<th>-ve Statements</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Learning Science in School</td>
<td>20</td>
<td>15,25,28,29,34,35</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Self Concept in Science</td>
<td>10,14,19,21,33</td>
<td>3,4</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Practical work in Science</td>
<td>24</td>
<td>8,22,23,31</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Science Outside the School</td>
<td>6,12,32</td>
<td>13,11</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Future Participation in Science</td>
<td>17,26,30</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Importance of Science</td>
<td>1,2,5,9,27</td>
<td>7,9</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

b) Validity and Reliability of the Test

To estimate the validity of the scale the criterion related technique was used. The scale was administered on a sample of 50 students and the responses were scored. The Pearson’s Product Moment Co efficient of Correlation was calculated to find out the validity of the scale and it was found to be 0.69. It indicates the scale is valid tool to measure the Attitude towards science.

To calculate the reliability, the Pearson’s Product Moment Correlation formula (Garrett, 2004) was used which is

\[ R = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{N\sum x^2 - (\sum x)^2} \sqrt{N\sum y^2 - (\sum y)^2}} \]

Where,
- \( \sum x \) = Total score for first half items
- \( \sum y \) = Total score for second half items
- \( N \) = Number of students

This gave the reliability of the Attitude scale i.e. 0.69. This was correlated for full length of the scale by using the formula \( r = 2r \). This reliability thus obtained was 0.83.
c) Scoring

In the rating scale, each response was rated by giving scores. For positive statements the scores were given as follows.

5, 4, 3, 2, 1

For negative statement the responses were scored as follows.

1, 2, 3, 4, 5

The summated score of all the 35 items provide the total Attitude measure towards science score of pupil.

d) Administration of Attitude Scale

The Attitude scale towards science was administered on hundred students. The response sheet was provided to the students and the statements were read by the investigator and were given proper instructions to make the response carefully.

The Attitude Scale and its response sheet are given in Appendices III and IV.

3.8.3 Preparation of the Multimedia Approach Materials (MMA)

After the thorough analysis of syllabi and text books from VII standard of CBSE, suitable six chapters were selected. The selected six chapters are the following:

Chapter VII  Weather, Climate and Adaptations of Animals to Climate
Chapter VIII  Wind, Storms and Cyclone
Chapter IX  Soil
Chapter X  Respiration in Organisms
Chapter XI  Transportation in Animals and Plants
Chapter XII  Reproduction in Plants

It was then discussed with senior teachers and resource persons handling Science at Upper Primary Level for proper guidance. The investigator then analysed each chapter separately to prepare Multimedia materials.
From the Chapter VII “Weather Climate and Adaptations of Animals to Climate”, the investigator prepared 16 slides and included in the MMA. The components of Multimedia used in this chapter were arranged in 16 slides and the details of Multimedia materials of 16 slides of Chapter VII are given below:
Slide 1 and 2 – Text, Slide 3 – Picture of raingauge, Slide 4, 5 and 6 – Text, Slide 7, 8 and 9 – Pictures showing different weather conditions, Slide 10 – Video clipping of thunder storms, Slide 11, 12, 13, 14, 15 and 16 – Pictures of different types of animals adapted to different weather conditions.

From Chapter VIII “Wind Storms and Cyclone”, the investigator prepared a total of 11 slides as Multimedia Materials. The 11 prepared slides include different components of Multimedia which covers the whole content of that chapter. The details of the Multimedia components used in this chapter VIII are given below:
Slide 1,2, 3, 4 and 5 – Text, Slide 6 and 7 – Pictures of formation of wind and anemometer, Slide 8 – Text, Slide 9 – Video clipping of movement of wind, Slide 10 and 11 – Text.

From Chapter IX “Soil”, the investigator prepared a total of 8 slides. The 8 slides prepared include different components of Multimedia which covers the whole content of that chapter. The details of the Multimedia components used in this chapter IX are given below:
Slide 1 and 2 – Text, Slide 3 – Text and Picture showing weathering, Slide 4 and 5 - Text and Picture of different types of soils, Slide 6, 7 and 8 – Text.

From Chapter X “Respiration in Organisms”, the investigator prepared a total of 20 slides. The 20 slides prepared include different components of Multimedia which covers the whole content of that chapter. The details of the Multimedia components used in this chapter X are given below:
Slide 1 and 2 – Text, Slide 3 – Video clipping of respiration, Slide 4, 5 and 6 – Text, Slide 7 and 8 – Picture of yeast and cellular respiration, Slide 9 – Video clipping showing breathing in human, Slide 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 and 20 – Pictures of breathing process, lungs, smoking, lungs of non smoker and smoker, human respiratory system, diagrammatic representation of functioning of lungs, respiratory system of cockroach, respiratory system of earthworm respectively.

From Chapter XI “Transportation in animals and Plants”, the investigator prepared a total of 18 slides. The 18 slides prepared include different components of Multimedia which covers the whole content of that chapter. The details of the Multimedia components used in this chapter XI are given below:
Slide 1, 2 and 3 – Text, Slide 4 – Picture of RBC, Slide 5, 6, 7, 8 and 9 – Text, Slide 10 and 11 – Pictures showing arteries and veins and structure of human heart, Slide 12 – Video clipping of breathing of heart, Slide 13 and 14 - Pictures showing structure of human urinal system and dialysis, Slide 15 – Text, Slide 16 and 17 – Pictures of transportation in plants and difference in plants and animals, Slide 18 – Text.

From Chapter XII “Reproduction in plants”, the investigator prepared a total of 35 slides. The 35 slides prepared include different components of Multimedia which covers the whole content of that chapter. The details of the Multimedia components of this chapter XII are given below:
Slide 1, 2, 3, 4 and 5 – Text, Slide 6 – Picture vegetative propagation, Slide 7 – Text, Slide 8 – Picture of budding, Slide 9 – Text, Slide 10 Picture showing fragmentation, Slide 11 – Text, Slide 12 - Picture of spore formation, Slide 13 and 14 – Text, Slide 15 – Picture of unisexual flower, Slide 16 - Text, Slide 17 – Picture of bisexual flower, Slide 18 – Text, Slide 19 – Picture of anther, Slide 20 Text, Slide 21 – Picture of plant ovary, Slide 22 – Text, Slide 23 – Picture of pollination, Slide 24 – Text,
Out of these listed out, by considering the suggestions put forward by the resource persons and experts in the science field, the investigator made certain changes and deletions and the number of slides to be included were 108 from the selected six chapters.

A try out study was then conducted with a sample of 30 students. By analyzing the learning strategy of the learners, certain modifications were made and finalized the MMA.

After try out and finalization of MMA, treatment was done on experimental group of 50 students selected. The investigator conducted classes with MMA materials prepared for the selected six chapters for a period of four months. Oral information and instructions were also given along with the Multimedia materials.

The schedule for treatment with MMA in given in the table shown below:

Table 3.8: Schedule for treatment with MMA

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of periods available</th>
<th>Chapters covered</th>
<th>Number of periods used</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>12</td>
<td>• Weather and Climate</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wind, Storm and Cyclone</td>
<td>3</td>
</tr>
<tr>
<td>September</td>
<td>20</td>
<td>• Wind, Storm and Cyclone</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Soil</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Respiration in Organisms</td>
<td>6</td>
</tr>
<tr>
<td>October</td>
<td>19</td>
<td>• Respiration in Organisms</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transportation in animals and plants</td>
<td>13</td>
</tr>
<tr>
<td>November</td>
<td>17</td>
<td>• Reproduction in plants</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Revision</td>
<td>5</td>
</tr>
</tbody>
</table>
The treatment with MMA was done for four months by taking a total of 68 periods. Six chapters could be completed within the available period of time and five hours were taken for revising the complete chapters taken for treatment.

The disc of the MMA is appended at the end of this thesis.

3.9 CLASS ROOM PROCEDURES IN EXPERIMENTAL GROUP

Multimedia Approach was used in the class room of Experimental Group selected. The prepared Multimedia materials were used to teach the selected six chapters from the VII standard science text book. Before starting the teaching process the teacher was given proper instructions for the students about the Multimedia and the way of teaching six chapters by using Multimedia materials.

The teacher gave a brief introduction about the content of the chapter he is going to deal with and providing the different Multimedia materials prepared one after the other while developing the teaching learning process in the Experimental class room. The teacher shows the slides and instructing the students for doing the activities in group and also individually according to the topic, observing the pictures given and discussing, observing the video clippings and understanding the texts given in the slides.

The learners can actively participate in the teaching learning process in the Multimedia class room. While developing the process of learning learners get more chance to participate in the activities given by the teacher. The class room activities include group discussion about the content matter given by the teacher, the observation of printed pictures of different content and interpretation of the content, observation of video clippings and discussing and analyzing the observed slides etc. After the end of each content the learners get chance to present their ideas framed from the given Multimedia materials. While developing the learning process it could
be observed that the boys were very actively participating at the performance level than that of girls. The boys had more previous knowledge in the content of science subject. The higher involvement in the classroom activities with the Multimedia Approach may probably affect the results.

3.10 CLASS ROOM PROCEDURES IN CONTROL GROUP

The tool for treatment of the control group learners is the Conventional classroom teaching. The investigator gathered information and observed the way in which science was taught to the VII standard students from their respective science teachers and then during the treatment period the Conventional method of teaching was adopted among the control group. In the Conventional method of teaching the teacher was dominating the class room. The same chapters taken for treatment with Multimedia were taught by Conventional method in which the learners are less active and getting less opportunities for doing experiments and discussing the content matter. The teacher imparts knowledge by using lecture method and also giving less activities. The students passively listening the teacher in most of the Conventional class rooms. Students were taught the selected area by the investigator. The students were less active in the class when compared to Experimental group and whenever the activities given by the teacher to be performed in the level of Conventional method, the girls have always shown interest in learning, participating actively and completing the given assignments on time.
SECTION – C

This section has in detail the selection of sample, experimental procedure and statistical techniques used in the study.

3.11 SELECTION OF SAMPLE AND EXPERIMENTAL PROCEDURE

For testing the efficacy of the Multimedia Approach, two groups were considered, one as Experimental and other as Control group. Both Experimental and Control group include 50 students and so the total number of 100 students were taken as sample from one CBSE School – Kunnamangalam Higher Secondary School, Kunnamangalam, Kozhikode District, Kerala.

a) Pre-Test

The pre test was administered for both Experimental and Control group and the mean scores of the pre test were calculated. It was found almost the same for both Experimental group and Control group.

b) Treatment

The study was conducted during the academic year 2011-2012. The Experimental group was given the MMA materials and the Control group was given the instruction of the same contents through the Conventional classroom teaching.

Details of the procedure of the study are given in Table 3.9.

Table 3.9: Details of the Procedure of the Study

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Group</th>
<th>Standard</th>
<th>Pre-Treatment Stage</th>
<th>Treatment stage</th>
<th>Post Treatment Stage</th>
<th>Number of Learners</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experimental Group</td>
<td>VII</td>
<td>Administered pre-test</td>
<td>Receiving multimedia materials</td>
<td>Administered post-test</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Control Group</td>
<td></td>
<td></td>
<td>Conventional class room teaching</td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>
e) Post Test

The investigator administered the post test on Knowledge and Skills and an Attitude scale among the Experimental and Control groups after the completion of the treatment period. The investigator analysed the scores of the Experimental and Control groups. Detailed analysis of the test scores is given in the analysis chapter.

3.12 STATISTICAL TECHNIQUES USED

To find out the efficacy of the Multimedia Approach the following statistical techniques were used. The scores obtained after conducting the post test were subjected to preliminary statistical analysis.

a) Descriptive Statistics

Descriptive statistics includes Mean and Standard Deviation. The mean in the most useful of all statistical measures. In addition to the information that it provides, it is the time from which many other important measures are computed.

Standard Deviation is used as a measure of spread or dispersion of scores in a distribution. Test of significance of difference between mean scores of independent samples.

b) test of significance of mean difference (t-test)

To compare the two groups, the data collected was subjected to the test of significance of mean difference.

It was concluded whether the mean difference was significance at 0.05 level or 0.01 level. The detailed description of analysis of the data is given in the analysis chapter.
3.13 CONCLUSION

The methodology adopted is described in this chapter. Total 100 students were taken as sample from two sections of VII Standard students of Kunnamangalam Higher Secondary School. One section was considered as Experimental group and the other as Control group. Achievement test and Attitude scale were administered prior to treatment to both the groups. Multimedia Approach was used in the Experimental group and Conventional method in the Control group. After the treatment for four months the Achievement test and Attitude scale were administered on the two groups. The data collected from the students of VII standard are analysed using appropriate statistical techniques for description and inferences. The statistical techniques used here are descriptive statistics Mean and Standard Deviation and ‘t’ test was used to find out the significance of difference. The details of data analysis and their interpretation will be presented in the next chapter.