Chapter 4

METHODOLOGY

4.1 Method adopted for the Study
4.2 Design selected for the Study
4.3 Samples selected for the Study
4.4 Tools and Materials used for the Study and their Administration
4.5 Statistical Techniques used for the Study
METHODOLOGY

“If I cannot learn the way you teach will you teach me the way I can learn”

(LD Child)

Research is the expert, systematic, objective, accurate, methodological and scientific investigation which starts rationally with a question or a problem, proceeds towards collection of evidence as desired by the formulated hypotheses through the use of reliable and valid tools. Researcher after careful, unbiased analysis of collected facts, very patiently and thoroughly draws inferences, conclusions and generalisations and suggests solutions to the problems.

Research methodology is a way to systematically solve the research problem. It is the science of studying how research is done scientifically. It is necessary for the researcher to know not only the research methods/techniques but also the methodology. The researcher has to design his methodology for his problem as the same may differ from problem to problem. The research methodology has many dimensions and research methods do constitute a part of the research methodology. Thus, when we talk of research methodology we not only talk of the research methods but also consider the logic behind the methods we use in the context of our research study and explain why we are using a particular method or technique and why we are not using others so that research results are capable of being evaluated by the researcher himself or by others (Kothari, 2004).

Research methods are of utmost importance in a research process. They describe the various steps of the plan of attack to be adopted in solving the research problem, such as the manner in which the problem is formulated, the definition of terms, the choice of subjects for investigation, the validation of data-gathering tools, collection of data, analysis and interpretation of data and the process of inferences and generalizations (Koul, 1998).

The selection of a method and the specific design within that method appropriate to the research problem will depend upon the nature of the problem and upon the kind of data. Method selected should always be appropriate to the nature of the problem under investigation and the kind of data that the problem
demands. The validity and reliability of the research findings also depend on the method adopted for the research work.

This chapter gives a detailed account of the procedure followed in the present study. The methodology of the present study is presented under the following headings.

4.1 Method adopted for the study
4.2 Design selected for the study.
4.3 Samples selected for the study
4.4 Tools and materials used for the study and their administration.
4.5 Statistical techniques used for the study

4.1 Method Adopted for the Study

Experimentation is a sophisticated technique for problem solving and may not be an appropriate activity for the beginning researcher (Best & Kahn, 2006). The process of examining the truth of a statistical hypothesis, relating to some research problem, is known as an experiment. When a group is exposed to some novel or special condition, it is termed as an experimental group.

The major objective of the present study is to identify the Dyslexic students from among those having Specific Learning Disabilities and to ascertain the effectiveness of the developed Multimedia package. So Survey cum Experimental is found to be an appropriate method to conduct the research. First level sample for the study were chosen by the Investigator on the basis of teacher nomination and previous academic performance by analysing the progress records of students. By the administration of the screening test, students with Specific Learning Disabilities and thereby those having Dyslexia were identified. The Investigator adopted Normative Survey method for this purpose. The identified Dyslexics were trained by means of the Multimedia package designed and prepared by the Investigator for minimising their reading errors.

4.2 Design Selected for the Study

Experimental design is the blueprint of the procedures that enable the researcher to test hypotheses by reaching valid conclusions about relationships between independent and dependent variables. Selection of a particular design is
based on the purposes of the experiment, the type of variables to be manipulated and the conditions or limiting factors under which it is conducted.

Figure 4.1: Research Design
Since the main objective of the present study is to develop a Multimedia Package for students at upper primary level with Dyslexia and to find out the effect of this Package in minimising the reading errors of the Dyslexic students, Single group pre-test, post test design was selected. When an experimenter uses this design, he measures the dependent variable before the independent variable is applied or withdrawn, and then takes the measurement once again. The difference in the measurement of the dependent variable if any is taken as the amount of change as a result of the application or withdrawal of independent or treatment variable. In this design, a single group of research participants or subjects are pre-tested, trained using Multimedia package and finally post-tested to find out the effectiveness of the Package. The design of the present study is given in figure 4.1

4.2.1 Variables of the Study

Variables may be defined as the conditions or characteristics that the experimenter manipulates, controls or observes. There are two types of variables: independent variables and dependent variables. According to Best & Kahn (2006), the independent variables are the conditions or characteristics that the experimenter manipulates or controls in his or her attempt to ascertain their relationship to observed phenomena. The dependent variables are the conditions or characteristics that appear, disappear or change as the experimenter introduces, removes or changes independent variables.

In the present study method of instruction, the Multimedia Package is selected as the independent variable. Dyslexic symptoms as well as Reading Attainment Scores are taken as dependent variables.

4.3 Samples Selected for the Study

In the present study, the sampling is done in two phases as the study involves survey and experimental methods. For the survey, stratified random sampling technique was adopted giving due representation to factors like Gender, Locality, Type of schools, Economic status & Nature of schools. Sixteen schools coming under Aided & Unaided Sectors were selected randomly from Ernakulam district. (The List of schools selected for the study is given in appendix R). The population of the study comprised of 1500 upper primary school students studying in V\textsuperscript{th} and VI\textsuperscript{th} standards of the English Medium Schools following state syllabus
of Kerala. From 1500 students, 425 samples were chosen for survey on the basis of teacher nomination and previous year academic performance by analysing the student progress records. The details regarding the break-up of the total sample selected for survey are given in table 4.1.

Table 4.1

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Sub-Samples</th>
<th>Groups</th>
<th>No of students</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gender</td>
<td>Boys</td>
<td>238</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>187</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Locality</td>
<td>Rural</td>
<td>221</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nature of Schools</td>
<td>Aided</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unaided</td>
<td>217</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Economic Status</td>
<td>APL</td>
<td>226</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BPL</td>
<td>199</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Type of Family</td>
<td>Joint</td>
<td>218</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nuclear</td>
<td>207</td>
<td></td>
</tr>
</tbody>
</table>

Out of 425 upper primary school students showing low academic performance (grade ‘C’ and below), the Investigator for the purpose of study identified 76 students having Dyslexic symptoms from Specific Learning Disabled by administering a Screening Test. For a child to be Dyslexic, he/she may show scholastic backwardness and should have normal intelligence. For the confirmation of the sample size, the Investigator thoroughly analysed the achievement of the obtained samples and found that all the students scored marks in the range 25-44% (grade ‘D’ and below). So these students were treated as scholastically backward as their scores matches with the anticipated condition for Dyslexia. After this, the IQ of these students were tested and found that they are having average or above average intelligence. In addition to this, samples of 50 primary school teachers who are dealing with these students were selected and data regarding the prevalent Dyslexic symptoms shown by the selected sample were collected from them.
through informal discussions and Checklists. On the basis of their reports, the final sample was thus confirmed to 76. Purposive Sampling technique was adopted by the Investigator for the sample selection for experimental method. Also, the sample selected for administering the Evaluation Proforma regarding the validation of the Multimedia package includes 20 Experts (List of Experts is given in appendix N).

4.3.1 Classification of the final sample.

1) Based on Gender :- Dyslexic Boys and Girls studying in the upper primary Schools constitute the Gender of the study.

2) Based on Locality :- Dyslexic Students studying in Rural and Urban based Schools are selected as sample.

3) Based on the Nature of the School :- Dyslexic Students studying in Aided and Unaided English Medium Schools are taken for the present study.

4) Based on Economic Status :- Dyslexic Students belonging to Above Poverty Line (APL) and Below Poverty Line (BPL) Category constitute the Economic Status of the study.

5) Based on the Type of Family :- Dyslexic Students coming from Joint family and Nuclear family are considered for the study.

The details regarding the break-up of the final sample is given in table 4.2

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Sub-Samples</th>
<th>Groups</th>
<th>No. of students</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gender</td>
<td>Boys</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>31</td>
<td>76</td>
</tr>
<tr>
<td>2</td>
<td>Locality</td>
<td>Rural</td>
<td>37</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nature of schools</td>
<td>Aided</td>
<td>44</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unaided</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Economic Status.</td>
<td>APL</td>
<td>43</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BPL</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Type of Family</td>
<td>Joint</td>
<td>34</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nuclear</td>
<td>42</td>
<td></td>
</tr>
</tbody>
</table>
The following exclusion and inclusion criteria were used during selection of experimental group.

**A. Exclusion criteria**
1. Dyslexic Students below the age of 9.
2. Dyslexic Students above the age of 12.
3. Dyslexic Students who are orthopaedically handicapped.
4. Dyslexic Students who are sensory handicapped.
5. Dyslexic Students who have other severe impairments.
6. Dyslexic Students who have visual/hearing impairments

**B. Inclusion criteria**
1. Dyslexic Students studying in regular Aided and Unaided schools following state syllabus.
2. Dyslexic Students studying in standards 5 and 6.
3. Dyslexic Students within the age group 9-12.
4. Dyslexic Students who are scholastically backward.
5. Dyslexic Students who have average or above average intelligence.

**4.3.2 Rationale behind the Selection of Sample**

In the present study, the Investigator selected upper primary school students studying in standards V and V1 of English Medium Schools following State syllabus. The limitations of time, effort, difficulty to obtain the sample were the major reasons for choosing a group of 76 students. Also, the Investigator has to make sure that the students know at least the basic skills of using a computer to keep the application-dynamics of the Multimedia Package more precise and focused.

**4.4 Tools and Materials used for the Study and their Administration.**
1. Student Progress Record.
2. Screening Test.
3. Checklist.
4. Intelligence Test.
5. Reading Miscue Inventory (RMI).
6. Reading Assessment Test (RAT).
7. Learning Style Checklist
8. Multimedia Package
10. General Data Sheet

4.4.1 Student Progress Record.

This record details the co-curricular abilities and progress of student in learning. It comprises of three parts: Personal Details, Academic Performance and Achievements in Co-scholastic areas (A sample copy of the record is given in the Appendix A).

4.4.2 Screening Test

Investigator adopted the Screening Test for Specific Learning Disabilities to identify those children with specific learning disabilities, prepared and standardised by Ashok Kumar and Sukumaran (2004).

Screening is a method of examining large number of children in presumably normal population. It helps to detect pupils who may need a more comprehensive examination. In screening, students in a particular grade, school or district is given a cursory test to ascertain those who need a more intensive evaluation. Here screening test is used to screen and identify children who are exhibiting delays and experiencing learning problems.

In the present study, screening has two major goals. The first goal is to identify high risk children and design intervention procedures. The second goal is to minimise the risk of exposing children to academic failures when they enter formal academics. The screening test adopted for this study is meant for students belonging to standards V and VI. The test consists of 13 subscales. Five specific abilities/skills are measured through these 13 scales. More than one specific ability can be measured through each sub-scale. These five abilities are perception, writing, reading, cognitive ability and mathematical ability. Since the test is used to
identify children with above mentioned five specific learning disabilities, questions are included from English and Malayalam languages and mathematics subject.

4.4.2.1 Test Description

Subscale-1

This subscale measures perceptual ability; specifically visual discrimination, figure ground perception and figure consistency. This ability includes the skills such as the ability to attend specifically to the stimuli-selective attention, which requires attention, ability to identify figures, shapes, graphics etc, despite its apparent change in direction and position.

Here the student perceives the problem figure and finds out the similar one from the options provided. The complexity increases with the serial number of the item. The abilities of attention and concentration are also measured through this subscale. The perception process is the initial step of cognition. Hence this scale is included in the measurement of cognitive ability also.

For example:

Look at the picture. Find out the picture similar to that from the pictures a, b, c and d. Put a tick mark (✓) in the corresponding box given.

Subscale.-II

Measures the reading and writing abilities. The most common symptom-reversal of letters and words are checked through this scale. The most frequently mistaken English letters and words are used in the scale. The perceptual disability may be the cause of the difficulties with the words. The scale is included in the scoring of perception, writing and reading abilities.

For example:
Rewrite the given letters to the blanks given on right side of them.

1. MWM .............................  2. bod ..............................
Subscale -III

This scale includes some most frequently reversing English words and some Malayalam letters and words. Some of the letters are avoided from the correct word in the case of Malayalam words. This is to check the tendency to irrational inference, and faulty sight-reading. Moreover, the answer sheet for this subscale is provided in the opposite side of the sheet. Hence the student has to keep the perceived letters or words in memory for a short span. This scale is included in the measurement of perception, writing and reading abilities.

For example:-

Rewrite the following letters corresponding to their numbers in the space given

1. WMW ............... 2. WAS .................

Subscale - IV

This scale comprises some Malayalam words, which are adopted from language textbooks of standard 5, 6, 7 and 8. The options given include strong distracters. This scale is intended to check the language ability and reading comprehension of the student. This scale is included in the measurement of reading ability.

For example:- Look at the words given in bold letters and find out the words having similar meaning from the four choices.

1. പള്ളി 2. പൊളി 3. പൊളി 4. പൊളി

Subscale -V

This scale consists of some Malayalam words, some of them are incorrectly written, i.e. some words or symbols are avoided, some letters are substituted by some similar letters etc. The learning disabled student tends to infer the incorrectly written word as the correct word. Besides this, perceptual disabilities also cause this type of inference to some extent. This scale is used in the assessment of writing, reading and perceptual ability.
For example:

Manipulate the letters, words and sentences in section (V) to the corresponding space given.

1. റാ റാ റാ .......................... 2. പ്ലിക്ക ..........................

Subscale- VI

This scale contains some simple sentences, of which two are correct and the rest are manipulated to check the reading ability of the student. The sentences consist of many sight-reading words. There are some letters missed, from the correct word. Learning disabled has a tendency to infer words incorrectly. This scale can effectively check this difficulty. This scale is included in the assessment of perceptual, writing and reading abilities.

For example:

Manipulate the letters, words and sentences in section (VI) to the corresponding space given.

ടാന്നൂള പുനരുത്തരം .................................

Subscale-VII

Subscale 7 consists of some common proverbs from Malayalam. This assesses the reading comprehension ability as well as the cognitive ability of the subject. The options provided are strong distracters. Options given are mainly word meaning of the proverbs. Hence some cognitive skills also are involved in this test. This scale is involved in the measurement of reading and cognitive abilities.

For example:

Look at the proverbs given below. Four statements corresponding to each proverb are given. Put a tick mark in the box corresponding to the statements showing the exact meaning of the proverb.
Subscale- VIII

This scale contains items to assess the perceptual ability, spatial relations, and position-in-space abilities. It involves the processes like perception of figures and geometric shapes, their size and relative position in space etc. The successful solution of these items needs a good reading comprehension also. This scale successfully measures the cognitive ability of the subject. This scale is included in the assessment of perception, reading and cognitive abilities.

For example:-
Identify the Correct Statements

1. B is the biggest of the three flowers
2. A is the smallest of the three flowers
3. A is bigger than B
4. C is smaller than B

Subscale- IX

This scale is exclusively meant for the assessment of arithmetic abilities. The four basic arithmetic calculations-addition, subtraction, multiplication and division-, concept of decimal, combination of the above said concepts etc are included in this scale. This scale uses only digits and symbols in its items, no
verbal explanations or questions are involved. This scale is solely meant for the assessment of mathematical ability.

For example

\[
\begin{array}{c}
\text{Add :-} \\
41 + \underline{12} \\
329 + \underline{647}
\end{array}
\]

**Subscale- X**

This subscale also is meant for assessment of mathematical ability. The basic arithmetic skills are assessed in this scale. The expressions include addition and subtraction. The options include distracters, which are most common arithmetic problems - eg. \(1+7=17\), \(71=7+10+1\) etc. This also is totally meant for the assessment of mathematical ability.

For example :

Which is the correct statement? Put (✓) mark in the box corresponding to correct answer.

\[
10 = 9 + 2 \quad \square
\]

**Subscale- XI**

Reading and writing problems occasionally express as mathematical disabilities. The child finds difficulty in reading and comprehension of digits. This scale is meant for the assessment of child's ability to read and write digits in words. The subject's awareness on the concept of place values is also assessed through this test. This scale is included in the assessment of writing and mathematical abilities

For example

Convert the given numbers to words.

1. 47  
   .................................

2. 128  
   .................................

**Subscale- XII**

This subscale aimed to assess the skill to decode verbal expression of numbers to digits. The number is expressed in verbal terms. The subject has to
write it in digits. The subject's reading comprehension and numerical ability are measured. This subscale is used in the assessment of writing ability and mathematical ability.

For example

Write the given words in numbers.

Subscale- XIII

This scale comprises some problems, which are expressed in verbal format. No digits or mathematical expressions are included in this scale. Through this scale the problem solving ability, metacognition, reading comprehension, and the ability to convert the problem situation to mathematical form are assessed. The problems include the arithmetic operations such as addition, subtraction, multiplication and division. The scale is included in the assessment of reading, cognitive and mathematical abilities.

For example: Answer the following question.

One pen costs 4 rupees. Then the cost of three pens is ________ rupees.

4.4.2.2 Reliability estimates of the subscales included in the Screening test

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Sub Area</th>
<th>Split Half Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perception</td>
<td>0.862</td>
</tr>
<tr>
<td>2</td>
<td>Writing</td>
<td>0.866</td>
</tr>
<tr>
<td>3</td>
<td>Reading</td>
<td>0.857</td>
</tr>
<tr>
<td>4</td>
<td>Cognitive</td>
<td>0.916</td>
</tr>
<tr>
<td>5</td>
<td>Mathematical</td>
<td>0.931</td>
</tr>
</tbody>
</table>

Content validity and face validity of the test was established with the help of experts (A copy of the Screening Test in Malayalam & English version is given in appendix B & appendix C respectively).
4.4.2.3 Test administration

425 students selected were undergone the test for identification of Specific Learning Disabilities. Subjects were given the tool after proper instruction. There is no strict time limit for any subtest. If about 75% of the subjects completed the task or stopped the work, 5 minutes more is given to the rest of the students. Space is provided in the tool for rough work. Though there is no strict time limit for the test, it took approximately 1 hour 30 minutes. Students having sensory impairment and other handicaps were excluded from the test. Various extraneous variables which influence the learning ability were not considered here.

4.4.3 Checklist

The checklist was prepared in consultation with the experts working in the field of Association for Learning Disabilities India, Clinical psychologists and Special educators (List of experts is attached as appendix N). Checklist helps teachers to observe children and record their performance in various areas and identify the difficulties faced by them. This test has productive validity and assesses skills needed by children to succeed in school.

The checklist contains 25 questions. The questions were prepared by giving due weightage to the noted Dyslexic symptoms and the area in which the intervention programme is required. The questions concentrate on the main features like Reversal, Substitution, Omission and Addition of words or letters. It also consists of statements related to symptoms of Dyslexia in reading, writing, listening, arithmetic and social interaction. The statements given in the checklist regarding learning disability symptoms were provided with Yes or No responses which score 1 & 0 respectively. Thus the total score of the Screening Test is 25 (A copy each of the Malayalam and English versions of the Checklist are enclosed in appendix D and appendix E respectively).

4.4.3.1 Administration

The checklist was administered to 50 upper primary school teachers who are dealing with 76 Dyslexic students. The report of prevalent symptoms of
Dyslexia among the selected upper primary school students were collected from the teachers.

### 4.4.4 Intelligence Test

The first intelligence test was developed by Alfred Binet in 1904. Intelligence is a collection of faculties including judgment, practical sense, initiative and the ability to adapt with circumstances (Binet & Simon, 1916). It is important to know that different intelligence tests are based upon different definitions of what constitutes intelligence. As a result, different tests may measure different skills and abilities. There are a number of skills that an intelligence test appears to measure—social judgement, level of thinking, language skill, perceptual organisation, processing speed and spatial abilities. Intelligence tests can also yield valuable information about a student’s ability to process information. Intelligence tests are more helpful when they are used to determine specific skills, abilities and knowledge that the child either has or does not have and when such information is combined with other evaluation data and then directly applied to school programming.

#### 4.4.4.1 Raven’s Progressive Matrices (RPM).

RPM was first introduced in 1936 by J.C. Raven. RPM is a non-verbal test of inductive reasoning based on figural stimuli. This test has been very popular in basic research and is also used in some institutional settings for the purpose of intellectual screening. The RPM is particularly valuable for supplemental testing of children and adults with hearing language or physical disabilities.

RPM was originally designed as a measure of Spearman’s ‘g’ factor. Raven’s test is actually a series of three different instruments. Even though the three forms of the RPM resemble one another, there may be subtle differences in the problem solving strategies required by each.

The coloured progressive matrices is a 36 item test designed for children from 5-11 years of age. Raven incorporated colours into this version of the test to help to hold the attention of the young children.
Factor I of the test consists largely of very difficult items and might be termed closure and abstract reasoning by analogy. Factor II is labelled pattern completion through identity and closure. Factor III consists of easiest items and is defined as simple pattern completion. The very easy and the very hard items of the Coloured Progressive Matrices appear to tap different intellectual processes.

For the Coloured Progressive Matrices, split half reliabilities in the range of 0.65 to 0.94 are reported with young children producing lower values. The validity coefficient with achievement tests range from the 0.30 s to the 0.60 s. Validity coefficient with the other intelligence test ranges from 0.50 s to 0.80 s (A copy of the scoring sheet of the test is given in the appendix F).

4.4.4.2 Administration of the test

The intelligence test was administered to the final sample of 76 Dyslexic students. The results revealed that all the 76 Dyslexic students belong to ‘normal’ or ‘above average’ intelligence group, which is a condition for a student to be Dyslexic.

4.4.5 Reading Miscue Inventory (RMI)

Often resource teachers in India may not have access to the formal test materials related to learning disabilities. It may be more area and culture specific and more reliable if teachers prepare an assessment package to identify the concerned child’s strengths and weaknesses. However, to achieve this, it is important that teachers have a wide knowledge of reading processes. Such a type of informal assessment would also help teachers study the child in greater detail and over a longer period of time. This would preclude any error obtained in assessment due to factors such as emotional disturbances and behavioural disorders.

An Informal Reading Inventory (IRI) is an instrument which helps to estimate the child’s general reading level. Unlike a standardised test, the child is not tested with reference to other children, but an overview of his general level of reading competence is obtained. Teachers can also make inventories of their own
based on published instruments. Teachers should begin testing at a level that is at
par, or slightly below, the child's level of current independent performance. While
the student is reading, the teacher should note the errors made as this will help in
planning a remedial programme. The IRI have several advantages. It is an easy-to-
construct assessment tool that also helps in planning remedial reading materials.
Results from an IRI can be used in classroom instruction

Reading Miscue Inventory (RMI) is used for recording oral reading. The
RMI offers a qualitative analysis of the miscues made during oral reading. Miscues
are an indication of the child's underlying language structures and need to be
analysed carefully according to graphic, syntactic or semantic characteristics.
Miscue Analysis is the method of assessing a child's reading level by analyzing the
errors made while reading. It is also known as the psycholinguistic process, it was
developed by Goodman and Burke in 1970. Miscues or errors refer to deviations
from the printed text that the student makes while reading orally. These miscues
provide diagnostic opportunities to the teacher to understand the student’s
language patterns. Such analysis also provides information on whether the student
makes phonic errors or morphological errors.

4.4.5.1 Preparation of RMI

The Investigator prepared RMI for assessing the type of reading errors in
the Dyslexic students before and after the implementation of Reading Assessment
Test (RAT) & Multimedia Package. The details of the procedure involved in the
development of the test are given below.

The investigator thought of preparing the tool after getting insight by
attending an international workshop cum seminar on ‘Making inclusion happen-
Learning for all students’ organised by Centre for Learning Disabilities and
Difficulties(CLDD),Department of Education, University of Kerala. For the
development of RMI, the Investigator sought the help of the supervising teacher
and leading, eminent educationalists and experts in the field of Learning
Disabilities.
Reliability

All possible measures were adopted to establish the reliability of the inventory. It is not possible to drop any question in the inventory on the basis that it is either difficult or easy because the Investigator is assessing and tabulating the reading errors of Dyslexic students in a tabulation chart using RMI. It is not possible to adhere to statistical procedure for this inventory. The investigator therefore relied mostly on non statistical procedure to determine the reliability of the inventory. Efforts were made to improve the items in the inventory in consultation with the experts in the field.

Validity

The validity of the inventory has been answered in terms of definition and representation given to the concept under measurement. Two types of Validity found out by the investigator are given below.

Content Validity

The criterion of content validity of the inventory is often assessed by a panel of experts in the field who judge its adequacy, but there is no numerical way to express it (Best and Kahn, 2006). The Investigator relied mostly on non-statistical procedures to determine the validity of the inventory. The content validity of RMI has been established by a panel of Experts in the field of Learning Disabilities(List attached in appendix N). The inventory is ensured to have content validity since the sections of the inventory are related to the topic under investigation.

Construct Validity

Construct validity of the inventory may said to measure a theoretical construct or trait. Construct validity of the RMI was ensured by giving simple, clear and unambiguous items.

Moreover, a try out of the inventory was made on a sample of 50 V\textsuperscript{th} and VI\textsuperscript{th} standard upper primary students to find out the practical difficulties if any, in
the administration of the tool. The Pilot testing of the tool also helped to establish the validity. Thus utmost care was taken by the Investigator to see that the inventory used for the study had content and construct validity.

4.4.5.2 Test details

The Reading Miscue Inventory (RMI) includes two Sub-tests: Sub-test A and Sub-test B.

Sub-test A is a Word Recognition Skill Test. In this sub-test, certain words are given that matches with the syllabus of standard 1 to 6. Students have to pronounce it loudly and clearly. In the Sub-test B, a reading passage is given and the students are asked to read the passage with fluency and without any pause. The subject is required to respond to each word in the passage (A copy of the RMI is attached in appendix G). The frequency of the type of Reading Miscues made by each student was tabulated in a sheet (The tabulation sheet is shown in appendix H).

4.4.5.3 Administration

The Investigator implemented RMI among the 76 Dyslexic students to find out the extent of reading errors. The current level of reading of the children is obtained using the tool. The grade levels of reading of the students are also obtained using this inventory. It is found out that almost all the Dyslexic students have the reading level corresponding to standard I and II. So the Investigator has included in the Multimedia package, activities that meet the requirements of lower primary class students also.

4.4.6 Reading Assessment Test (R A T)

The Investigator prepared and standardised a Reading Assessment Test for assessing the level of reading disorders in the Dyslexic students before and after the implementation of the Multimedia package. The details of the procedure involved in the development of the test are given below.
4.4.6.1 Preparation and standardisation

Before constructing the test, the Investigator consulted experts in the field of special education and went through some of the tests constructed by them. Their advice was used to prepare the tool. The English Readers prescribed for standard V and VI was relied upon for the construction of the test to ensure its content validity. The Reading Assessment Test was prepared by giving due weightage to errors shown by the Dyslexic students in the RMI. Appropriate weightage is also given to reading and writing. The Investigator prepared simple questions and most of the questions were related to noted Dyslexia symptoms and the area in which the intervention programme is required. The nature of the questions are based on the reading errors obtained early through RMI. Based on the expert suggestions, some items were modified (The list of experts consulted during this phase with their designations is given in appendix N).

The Investigator strictly followed the steps for constructing the Reading Assessment Test. It is given in figure 4.2.

```
Select the content area

Identify the errors

Decide the span of skills (1st and 2nd std.)

Construct Items

Administer

Score and Interpret
```

**Figure 4.2: Steps followed for constructing Reading Assessment Test.**

The Investigator first prepared 30 items for the test and this was again submitted to the experts and primary school teachers who teach English. Based on their suggestions, some items were deleted. Thus a draft form of the test with 22
sections incorporating questions for reading and writing was developed (The draft form of RAT is given as appendix I).

The draft Reading Assessment Test in English was administered on a sample of 150 \( V^{th} \) and \( VI^{th} \) standard students of different schools in Ernakulam district. The answer sheets of all the 150 subjects were scored and arranged in the descending order of scores for item analysis. The top 27% in the group were arranged in the descending order of the total scores and the bottom 27% alone were used as extreme groups for item analysis. The scores obtained for each item in these extreme groups were used for calculation of the discrimination power of each item. The discrimination power was obtained by calculating the critical ratio (‘t’). For evaluating the responses of the high and low groups to the individual statements, the critical ratio was found using the formula,

\[
\frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum (X_{H} - \bar{X}_H)^2 + \sum (X_{L} - \bar{X}_L)^2}{n(n-1)}}}
\]

Where,

- \( \bar{X}_H \) → the mean score on a given statement for the high group.
- \( \bar{X}_L \) → the mean score on the same statement for the low group.
- \( X_{H} \) → the score for a given individual for a given statement in the high group.
- \( X_{L} \) → the score for a given individual for a given statement in the low group.
- \( n \) → number of subjects in the criterion group.

(The ‘t’ values of the items in the draft form of RAT to identify the disorders of reading is enclosed in the appendix J). For the preparation of the final test, 17 items having the ‘t’ values greater than 2.58 in the group were selected. Thus, a final form of the test consisting of 17 sections was selected for administration. The maximum marks allotted for the test is 125. The maximum time required to complete the test is 3 hours.
Reliability of the Reading Assessment Test

Reliability of the test is usually expressed by a co-efficient of correlation which is called reliability coefficient. Two methods used by the Investigator to determine the reliability of the test are given below.

Test-Re-test Method

In the test-re-test method, the same test is administered twice to the same group of students after an interval of 15 days. The two test scores thus obtained was used to determine the reliability co-efficient which was found to be 0.76.

Split-half Method

It is the method of splitting the test into halves and finding the correlation between the two halves. The answer sheets of 100 students studying in Vth & VIth standards of upper primary school students were used for the purpose. The scores obtained for each individual for the test are divided into two groups by pooling into odd number items and even number items. The reliability of the whole test was calculated by the Spearman Brown Prophecy formula.

$$R=\frac{2r}{1+r}$$ (Garrett; 1981)

The scores of the two halves were correlated and the reliability co-efficient of the whole test was calculated as 0.79

This shows that the Reading Assessment Test for identifying learning disability in reading as a whole is a reasonable, valid, and reliable instrument for the purpose of the present investigation.

Validity

Two types of Validity found out by the investigator are given below.

Content validity

The content validity of the test was maintained by careful reference of the current literature related to area of study, English readers of standard V and VI as well as by consultation with experts.
Concurrent validity

The concurrent validity of the test was ensured by correlating the test scores with the class exam marks of 100 students chosen at random from standard V and VI. The class exam marks were collected from the progress report of the concerned students from the school. The validity co-efficient was found to be 0.67. So the test is reasonably valid for the reason for which it is constructed.

This shows that the Reading Assessment Test for identifying learning disability in reading as a whole is a reasonable, valid, and reliable instrument for the purpose of the present investigation.

4.4.6.2 Details of the Reading Assessment test

The final form of the Reading Assessment Test includes 17 test items. The items included in the test covers all areas that are helpful to check their reading disabilities and thus each test item is unique. A brief description of the test, scoring of test items and the administration of the test is given here.

The first question included in RAT is a completion type item with short vowel sounds. 12 words are given which carries 1 mark each and a total of 12 marks is thus assigned. The 2nd question is a matching type one where the students have to recognize the right word from the choices that match with the first word in each row. Four items are included which carries 1 mark each and thus a total of 4 marks is assigned. The 3rd item consists of 3 multiple choice questions where students have to recognize the right word from the distracters given in brackets. Each question carries 1 mark and thus a total of 3 for the whole item is assigned. The 4th item is to check the ability of students to make meaningful words from the beginning letters that are provided to them. 10 items are provided. Each question carries 1 mark and the total mark assigned is 10. The 5th question is a fill in the blank type where students are asked to fill the gaps selecting suitable word given in brackets. 5 items are included. Each question carries 1 mark each and thus a total of 5 marks is given.
In the 6th item, certain words with their initial sound are provided. Students have to identify and mark the words given in brackets that contain this sound. This item carries 5 marks. Question 7 includes some statements with blanks. Students should fill the blanks with the right word given in brackets. This part is assigned 4 marks. Item 8 comprises of 4 statements. The students should tick the right word against each statement from the words given on the right side of each statement that resembles with the meaning of the sentence. Each statement carries one mark. In question 9, five sentences are given. The students are asked to correct the sentences using proper punctuation marks. Question 10 consists of five words written correctly and incorrectly. Students are asked to tick (✓) the right word. Each question carries one mark and the total mark assigned is 5 for item 9 & 10 respectively.

In item 11, five phrases/sentences are provided with suitable pictures. The students have to select the apt picture related to each sentence /phrase given using tick (✓) mark and the total mark assigned is 5. In question 12, a story is given. The student is asked to read the story carefully and answer the questions given at the end of the story. The four questions carry one mark each. A poem is included in question 13. The student should read the poem carefully and answer the questions given at the end of the poem. The total mark assigned to this part is three. In items 14a & 14b, the teacher should dictate ten English words loudly and clearly and the students should write them correctly in capital letters (words:- thought, dream, festival, sparrow, beginning, performance, conversation, nothing, singer, competition) & small letters (words:- coward, booth, protest, patience, museum, complaint, disappeared, spread, presentation, announcement)) respectively. Both parts carries ten marks each.

In item 15, 25 words are given and the student is asked to read the words loudly without any mistake. The total mark assigned to this item is 25. Each correctly read word carries 1 mark.

Item 16 tests the reading skill. Here a passage is given and the student is asked to read it. The words which are not correctly spelt are to be indicated by putting circle over the word and errors if any, like addition, substitution, reversal,
omission, repetition, mispronunciations & refusals are also noted. Four marks are assigned to this item. In question 17, the students have to fill the blanks in the sentences provided with options like was, were or had. Each question carries one mark and a total of five marks is assigned (A copy of the final reading assessment test is given in appendix K).

**Administration**

The Reading Assessment Test was administered to the final sample of 76 Dyslexic students in appropriate intervals of time. A minimum of 5 periods were required to complete the test.

**4.4.7 Learning Style Checklist**

The notion of learning styles is not new, but seems to have revived in the past few years. Learning styles theory suggests that students may learn and solve problem in different ways and that some ways are more natural for them than others. Learning style is that consistent pattern of behaviour and performance by which an individual approaches education experiences. It is the composite of characteristic cognitive, affective and physiological behaviours that serve as relative stable indicators of how a learner perceives, interacts with and respond to the learning environments. Learning styles of students are determined by combination of heredity and environmental influences. Some learn most effectively those things they hear. Others learn best when they see material in writing and some students prefer considerable structure. Others learn best in a formal surrounding; some prefer an informal relaxed environment. Some can concentrate only in an environment which is completely free from disturbances, others like to learn in noisy and active environments. Some learn best when they follow intuition while others prefer to learn by following logical sequential steps.

“Learning style is the way that the students begin to concentrate on process, internalise, remember new and difficult academic information” Many people can learn things that are easy for them without their learning styles but all people can
learn new and difficult information better when they capitalize on their styles (Dunn & Dunn, 1993).

**VAK Learning Styles**

The VAK learning style is the model used in neuro linguistic programme. It uses three main sensory receives – visual, auditory and kinesthetic (movement, tactile or touch) to determine the dominant learning style. Learners use all three to receive information. However, one or more of these receiving styles are normally dominant. This dominant style defines the best way for a person to learn new information by filtering what is to be learnt. The concept of accelerated learning which incorporates the principles of neuro linguistic programming and multiple intelligence takes the view that each of us has a special view of learning that suits us best. If we are able to learn techniques that correspond with our preferred learning style, then that learning becomes faster, more enjoyable and more effective to integrate these styles into the learning environment. The characteristics of the different learning styles are given.

**Visual Linguistic:** They prefer to learn through written language. They remember what has been written down. They like to write down directions.

**Visual Spatial:** They have difficulty with written language; they do better with charts, demonstrations and videos. They visualize faces and places by using their imagination.

**Auditory:** They talk to themselves a lot. They may have difficulty with reading and writing faster. They often do better talking to a colleague or hearing what was said.

**Kinesthetic:** They tend to lose concentration if there is no external stimulation or movement.

**Tactile:** When listening to lectures, they may want to take down notes. They use colour highlighters and take notes by drawing pictures or material first and focus on details.
4.4.7.1 Administration of the Learning Style Checklist

The checklist is a tool adopted from Association for Learning Disabilities India (ALDI), Thrissur, Kerala. The tool comprises of statements related to visual, auditory and kinesthetic styles of various aspects like learning, spelling, handwriting, remembering, visualising, distractions, solving problems, talking to others and getting dressed. Identifying the factors that positively impact the child’s learning may be very valuable in developing effective intervention strategies. When they are taught or asked to perform in ways that deviate from their natural style, their performance will be affected. So the Investigator has decided to administer the Learning Style Checklist among the final sample to find out the particular learning style that is be followed by them. A Multimedia Package (MMP) was developed, standardised and validated by the Investigator by giving due weightage to the identified Learning Styles. The scores obtained are tallied in the appropriate boxes given for visual, auditory and kinesthetic learning styles (A copy of the Learning Style Checklist is enclosed in appendix M).

4.4.8 Multimedia Package

Early intervention and remedial education is essential to diagnose and overcome the learning disabilities and prevent school failures of Dyslexic students. The major objectives of the present study are to identify the Dyslexic students from among those having Specific Learning Disabilities, development of the Multimedia package and to ascertain the effectiveness of the developed Multimedia package. The Investigator has decided to prepare a Multimedia Package because related literature has given significant evidence to the need for a Multimedia intervention programme from primary school level itself. Also various educational boards and special education teachers recommended the importance of Individualised Education Programme (IEP) for the Dyslexics. Thus the problems faced by these differently-abled students in inclusive classroom settings forced the Investigator to develop an intervention programme to train them to cope with the peers, changing society and lead a meaningful and successful life with confidence. The Reading Miscue Inventory (RMI) scores and Reading Assessment Test (RAT) scores
helped the Investigator in planning appropriate materials for remediation. Multimedia Package is a Reading Development programme meant to improve the current level of reading ability of the student.

### 4.4.8.1 Media in instruction

In any given teaching-learning situation, the three prime players are instruction, instructor and technology. To achieve the best results, the three must be in complete harmony with each other, collectively working towards attainment of set objectives. Sufficient evidence is available to show that positive results can be obtained when carefully designed media-based materials are used for instruction both for group or individual learning. Some important benefits reported are-

- Media can enhance motivation.
- Media makes content selection more intelligent and better organised.
- Media helps to overcome constraints of time and pace.
- Media helps to enhance the quality of learning and instruction
- Media helps to make the delivery process more sophisticated and standardised.
- Media helps to package information more intelligently ensuring active participation of the learner.
- Media makes the act of teaching more pleasing, interesting and rewarding for the teacher.

### 4.4.8.2 Designing Instructional Media

Any discussion regarding the design and development of instructional media must be preceded by a clear understanding of the term instructional design. Instructional design refers to application of well-defined procedural steps for designing instruction and instructional resource materials. A number of related activities are involved which include: identification of objectives, formulation of instructional strategies, development of media-based components, evaluation of learning outcome etc. Instructional design is meant to ensure effectiveness and efficiency of methods and materials used for delivering instruction. While designing media-based instructional materials, it is important to keep in mind, not only the learner profile but also the mode in which instruction is proposed to be
delivered. One must consider whether it is a large group (lecture), small group (tutorial) or individual (self-paced study).

Other factors which must be taken into consideration are the availability of time and infrastructure both in terms of hardware and software. But, irrespective of the model of instruction or strategy selected, the starting point is invariably the formulation of instructional objectives and one must begin with mastering the art and technique of writing them. The most effective way to study Instructional design, therefore, is through the Systems Theory. The Systems Approach recommends application of rational procedures for designing instruction to ensure attainment of specific behavioural objectives. And, media becomes an important tool playing a pivotal role in the whole process. Instructional design does not always refer to an entire course; it is equally valid for a single unit or a module. Attention must be paid to specific learning tasks.

Media meant to be used for instruction must be well planned, carefully prepared and then used effectively.

i) Planning

Designing instructional media demands a great deal of planning. Planning is a structured procedure, requiring organisation and logical sequencing of components to be taught. The components then must be integrated into a unified whole. When one plans to develop some media-based resource material, the activity translates into answering a series of questions and taking valid decisions. Some of the major concerns are-

- What are the objectives to be served?
- What is the specific content to be treated?
- Which medium suits the purpose best?
- What is going to be the planned sequences of visuals?
- What should be the format of the programme (story, drama, narration…)?
- What is most appropriate- captions or sub-titles?
- Should there be graphics or photographs?
- Should anything else be included?
ii) Preparation

Once all the questions have been answered and the initial planning is completed, one has to get started with the preparation for developing the materials. At this stage, a different set of decisions need to be taken. It is important to decide how much investment in terms of money and time is justified; how much work should be done by whom; which are the areas in which expert help may be required. The best way to begin here is to work out the different tasks involved and identify the best person to do each one of them. In the present age and time, it is often cheaper and more efficient to outsource i.e., get work done commercially. These decisions are very important and should be taken objectively.

The most important step in preparation of any media-based resource material is the development of a storyboard or a script. A storyboard is a sequence of scenes, frames or units in which the desired media format is arranged for presentation. The technique essentially borrowed from the films, allows one to arrange and rearrange a whole sequence of small sketches or representations along with the verbal component. The storyboard is like the blueprint of a building. It helps one to think clearly and take correct decisions. It saves time and cost, ensures continuity and puts the author/director in total command.

Finally, it is important to validate the material developed. The media option should be evaluated for its academic and motivational value. It is a good idea to preview the material with some colleagues mostly to identify areas which have not been included. It is always possible to create a handout to cover such points.

iii) Using and Integrating Media with Instruction

Most often media options are used by teachers in an incidental manner. An instructor may decide to show a video clip or a set of 35 mm slides just because she happens to have one available with her. The success of the media option lies in its effective use by the teacher. To begin with, it is necessary to review the instructional objectives. The concepts treated should be directly relevant to the
objectives and should help in ensuring the learning outcomes. Questions must be invited immediately after the media option has been used. One need to be clear about the type of questions (closed/open ended) should be asked and what kind of feedback one is looking for. Good questions work wonders in promoting positive learning attitude. To reinforce learning, it is always better to have some additional related follow up activity. These are also best planned at the initial stage and as an integral part of the media.

4.4.8.3 Design and features of Multimedia Package

Multimedia Package is developed for upper primary school students to enhance their reading abilities by minimising Dyslexic symptoms and is based on the theoretical constructs of Dyslexia. It is developed by the Investigator under the instructions of research guide after attending a lot of training programmes/seminars/workshops related to specific learning disabilities and also seminars on Dyslexia conducted by ALDI (Association for Learning Disabilities India, Thrissur, kerala, India). Keeping in mind all these value points, the English Readers prescribed for standard V and VI were also relied upon for the construction of the package to ensure the content validity of the package. Before the final implementation of the package among the experimental students, a pilot study was conducted at different primary schools of Ernakulam district in Kerala. Modifications are made on the basis of the pilot study and the Package is validated with a team of experts in this field (The list of experts involved in the validation of the package is shown in appendix N).
The basic steps used to design instruction is given in the figure 4.3

To prepare the content and activities for the transaction of the Package, the researcher thoroughly analysed the lessons of the English Readers prescribed for standard V and VI, course books, teacher’s handbooks of Kerala State syllabus, e-resources, and received opinion of experts and experienced teachers. The followings steps are followed for the preparation of the package.

- **Simple to complex**
  Each theme was presented with learning activities. Gradually challenging activities with more mental processes were included. It helps to develop self-confidence among the students and to create interest in the subject.

- **Active involvement**
  Activities are developed by giving due consideration to the personal experience of the child, his real life.
• Acquiring a particular objective

Proper care was given to include various learning modalities of different dimensions for acquiring a particular objective.

• Conceptual level attainment.

Due weightage was given to concrete situations for conceptual level understanding.

In order to make the learning material attractive, pictures and illustrations from daily life are made use of its maximum possibility as suggested by experts to make necessary modification.

The model followed for the selection of stages in the Package was the ASSURE MODEL proposed by a group of academicians belonging to U.S.A (Heinich, Molenda, Russell & Smaldino, 1996). The acronym ASSURE stands for the six steps for designing instruction-

• Analyse Learner
• State Objectives
• Select Methods, Media & Materials
• Utilise Media And Materials
• Require Learner Participation &
• Evaluate & Revise

The model followed for designing the Instructional Media is given in figure 4.4
The elements in this model are inter-related and therefore, depicted in a cyclic form to indicate the ongoing nature of the various activities.

Based on the above instructional design and model, the Investigator developed the Multimedia Package. This Package is developed on the basis of ‘Learner-Centred’ dynamics, rather than ‘Teacher / Trainer-Centered’. Some of the features of MMP are

- It covers training for minimising all the reading errors.
- Each stage and phase is well defined and short enough to cover within the determined period of time.
- The instructional objectives and activities are properly sequenced.
The language used is clear and simple.

Students experience the output of each stage effectively.

Conclusion, review and feedback are ensured.

The initial and final assessments helped to assess the effectiveness of the Package.

**Software requirements of the Multimedia Package**

The investigator used Adobe Flash (CS 4 Version), Adobe Sound Booth (CS 4 Version) Compatible with Windows XP or later; XNL + Flash.

**Basic Stages in the Package**

There are three basic stages in the package, viz

1) **Preparation**,  
2) **Training And**  
3) **Evaluation**.

The initial one, Preparation stage, which is crucial for effective learning, involves preparation for change. The second one, training stage covers the change process itself. It includes the processes that help people change the way in which they view the world and deal with its social and academic demands. The final one involves evaluation stage. The pre and post tests were applied during the introduction and evaluation stages respectively.

The figure 4.5 shows the three stages of Multimedia Package and illustration of processes included in them.
The estimated duration for the administration of the Package is 60 hrs (i.e. about 66 periods of 45 minutes duration). This may vary according to the severity of the problem i.e. the extent to which how far a student is Dyslexic. The distribution of time assigned to each stage for its administration is given below.

Preparation stage (5hrs),
Training stage (50 hrs) and
Evaluation stage (5hrs)

The overview of different stages, phases and activities used for the implementation of Multimedia package is shown in the block diagram (figure 4.6)
4.4.8.4 Description of the stages in the Multimedia Package.

Stage- one: Preparation (5 hrs)

This is the initial stage during the implementation of the Package. During this stage, the Investigator made a good rapport with the students and explained that this intervention programme aims at their personal, social and academic achievement and success in life. The Investigator assessed the reading ability of upper primary school students using RMI & RAT, i.e., pre-tests. In order to obtain
more information about their individual differences, their anecdotal and cumulative records were examined; parent-teacher opinion and peer group opinions were also sort out.

**Stage-two: Training (50hrs)**

This is the second stage of the implementation of the Package. During this stage, the students were trained to reduce their reading errors. Multi dimensional themes and appraisal activities are adopted here to reach the aim. This stage consists of 4 phases, 33 themes and 13 appraisal activities respectively. Well-designed training programmes cannot be effective if institutional system in which they are rooted is not supportive of the training goals. Hence the Investigator made all necessary permission from the concerned authorities for the continuous rehearsal of the programme as a feedback for the students. (The sample slides of the developed and validated Package are given in the *appendix Q*).

The second stage is divided into four phases.

1. Phonological Awareness
2. Vocabulary Building
3. Morphological Awareness and
4. Reading Comprehension

All these four phases consist of various themes, instructional objectives, exercises based on various themes, appraisal activities, and finally feedback.

**Phase – 1: Phonological Awareness**

Phonological Awareness is the accurate perception of all the individual sounds or phonemes, within a spoken word. This definition also includes the perception of relationships between sounds such as rhyme. Phonemes are more abstract than syllables. The merging of sounds makes it very difficult to segment auditorally one phoneme from another. Training in language, especially phonetics and phonology provide the most appropriate background for teaching children and make them aware of the sound structure of language. The phonics approach
involves the pronunciation of different letter sounds. These sounds represent a fairly complex sound/symbol coding system and the student must master this system in order to “decode” an unknown word. These complex sound/symbol relationships can represent major stumbling blocks for many students with learning disabilities. In certain cases, these students will decode part of the word, based on the easiest sound-symbol relationships, and merely guess at the remainder of the word. Dyslexic individuals have difficulties with both phonological processing and naming speed. Different vowel, consonant and combination sounds are learned in isolation and then used as keys to pronounce unknown words.

The names and purposes of 8 themes, their sub-themes, activities related to the themes and appraisal activities used in the phase-one are described below.

1.1 Phonic Skills

**Objective:** To provide an information about a range of spelling sub-skills.

The Phonics approach involves the pronunciation of different letter sounds. In this, consonants, target words and sentences using the words are audio-recorded and allowed students to listen. The Investigator tells the meaning of each frame and students have to pronounce it along with each frame. One example from each sub-theme is given below. (Sample Prints attached in appendix Q, frame nos.1-15)

**Table 4.4**

**Examples of sub-themes coming under the theme Phonic Skills.**

<table>
<thead>
<tr>
<th>Alphabet letters</th>
<th>Target words</th>
<th>Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Consonant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>b</strong></td>
<td><strong>bun</strong></td>
<td>I had a big bun</td>
</tr>
<tr>
<td><strong>Final Consonant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>m</strong></td>
<td><strong>gum</strong></td>
<td>He likes bubble gum</td>
</tr>
<tr>
<td><strong>Short Vowels at the beginning of words</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>a</strong></td>
<td><strong>ant</strong></td>
<td>The ant bit my leg</td>
</tr>
<tr>
<td><strong>Short Vowels at the middle of words</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td><strong>tin</strong></td>
<td>He hide the tin of biscuits</td>
</tr>
<tr>
<td><strong>Initial Blends Consonant Clusters</strong></td>
<td><strong>flat</strong></td>
<td>They live in a flat</td>
</tr>
<tr>
<td><strong>fl</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Final Consonant Blends</strong></td>
<td><strong>sand</strong></td>
<td>We like to play with sand</td>
</tr>
<tr>
<td><strong>nd</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Initial Consonant Diagraphs

<table>
<thead>
<tr>
<th>Diagraph</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>wh</strong></td>
<td>whip</td>
<td>The rider lost her whip</td>
</tr>
</tbody>
</table>

### Final Consonant Diagraphs

<table>
<thead>
<tr>
<th>Diagraph</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ch</strong></td>
<td>rich</td>
<td>Sam is a rich man</td>
</tr>
</tbody>
</table>

### Long Vowels at the Beginning of Words

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>i</strong></td>
<td>iron</td>
<td>Iron this for me</td>
</tr>
</tbody>
</table>

### ‘y’ as a Vowel Says \( | e | \)

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>i</strong></td>
<td>fry</td>
<td>I can fry an egg</td>
</tr>
</tbody>
</table>

### Vowel Consonant Diagraphs

<table>
<thead>
<tr>
<th>Diagraph</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>er</strong></td>
<td>term</td>
<td>This term I did well</td>
</tr>
</tbody>
</table>

### Silent Letters

<table>
<thead>
<tr>
<th>Diagraph</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>wr</strong></td>
<td>wrist</td>
<td>He broke his wrist</td>
</tr>
</tbody>
</table>

### Vowels Diagraphs

<table>
<thead>
<tr>
<th>Diagraph</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ow</strong></td>
<td>crow</td>
<td>The crow is in the nest</td>
</tr>
</tbody>
</table>

### Prefixes

<table>
<thead>
<tr>
<th>Diagraph</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>mis</strong></td>
<td>misspell</td>
<td>I must not misspell his name</td>
</tr>
</tbody>
</table>

### Suffixes

<table>
<thead>
<tr>
<th>Diagraph</th>
<th>Example</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ful</strong></td>
<td>helpful</td>
<td>she is a helpful person</td>
</tr>
</tbody>
</table>

### 1.2 Two and Three Phoneme Words

**Objective:** To draw child’s attention to the smallest parts of words and to notice that the number of letters and sounds in a word are not always equal.

Here the two-phoneme and three-phoneme words are audio-recorded and allowed students to listen.

Examples:-

**1.21** Two- phoneme words: - my, it, day  
**1.22** Three- phoneme words: - sun, cup, bat

### 1.3 Commonly Reversed Words

**Objective:** - To acquire awareness about the fact that letters, parts of words or whole words may be reversed.

Words are recorded and introduced to students and they are asked to pronounce it immediately after the presentation.

Some examples :- tub, rat, ten, but, no
1.4 Homonyms (Homophones)

**Objective**: To make aware of the words that sound alike, but have different spelling and meanings.

Examples: - course- coarse dear-deer fair- fare

Students are shown these words and the trainer tell the different meanings also.

1.5 Direction Sense

**Objective**: - To make the children familiar with directions

1.51 **Sheet 1**

Example: - Colour the door with blue colour. Picture of a door is given and student should put appropriate colour to the door from various colours given. If the colour selected is not correct, then he/she cannot move to the next frame. A warning “That’s not blue” is shown. The student should repeat again.

![Figure 4.7: Slide showing an activity coming under the theme ‘Direction Sense’](image)

1.52 **Sheet 2**

Example: - put an X for the picture of ‘ear’ in the box provided. Here some figures including the picture of ‘ear’ is given. Student should put an X in the appropriate box. Otherwise a warning “your answer is wrong” is shown. (Sample is attached in appendix Q, frame no.20)

1.6 Consonant clusters

**Objective**: - To provide information about a word corresponding to beginning letter sounds.
Examples:-

1.61 Beginning Consonant Blends :- cl- clean      sp-spoon
1.62 Consonant Diagraphs :- gh – ghost      ph - photo
1.63 Three – letter clusters :- spl – splash    spr - spring

These sounds are also recorded and allowed students to listen. They should repeat the words.

1.7 Soft and hard sounds

Objective: - To associate the written letter with a particular sound.

Examples: - call , city, cell, gem, got

The Investigator tells that when ‘c’ has the sound of ‘s’ it has hard sound. When it sounds like ‘k’ it has the hard sound. Similarly for ‘g’ also. These words are also recorded.

1.8 Assessing student progress

Some activities related to the above themes are given and students should do it correctly. A feedback is obtained to the trainer while each student proceeds through the appraisal activities. Depending on that, the trainer should replay the phase for the required students so that they can do their best in successive stages.

1.8.1 Activity 1

Put ‘s’ after the sentence in which ‘c’ is soft and ‘k’ when it is hard.

eg: - We went to the camp -------

I saw his face -------

1.8.2 Activity 2

Put ‘x’ for the right word in the box provided. It must start with the same blend as the keyword.

Black

The sky is ............

dark □    blind □    blue □

1.8.3 Activity 3

Put ‘x’ for the right word in the box given. It must start with the same diagraphs as the keyword.
Church

We make butter in a

Chimney □ Pail □ Churn □

In all the appraisal activities, students can move to next frame only if their answer is correct. Otherwise warning signal is shown.

Phase – 2: Vocabulary Building

Vocabulary building is the ability to expand one’s vocabulary through listening and speaking, followed by reading and writing. Vocabulary development is a crucial skill where specialised terms are routinely introduced. Numerous strategies are frequently used to strengthen vocabulary. A thesaurus is essential to every classroom and children should be encouraged to use it.

The names and purposes of 10 themes, their sub-themes, activities related to the themes and appraisal activities used in the phase- two are described below.

2.1 Word list

The ability to pronounce a word does not necessarily indicate an ability to understand a word’s meaning.

Objective: - To make children aware of the most frequently used words in reading and also to make them achieve the greatest flexibility in reading.

Students are allowed to hear the sound and visuals of words in various groups and they must spell it after the presentation. Some examples are given below.

Group 1 :- Work, before, long, here, other, old, take, eat.
Group 2 :- Upon, first, came, bin, am, where, ball, morning.
Group 3 :- Ask, fire, car, sister, happy, show, try, once.
Group 4 :- Wear, father, side, above, poor, land, receive.
Group 5 :- Hour, grade, glad, brother, beautiful, afternoon.

2.2 Word Recognition

Sight –word approaches was used in which students memorise words by sight. This test is designed to sample the pupil’s ability to read words representative of the primary vocabulary.
Objective:- To encourage an appraisal of the picture context which is immediately utilised in the perception of the word.

2.2.1 Sheet 1

Recognise the word corresponding to the picture. Here the picture of ‘hat’ is given. Student should fill the appropriate box corresponding to the answer. Here also warning signal is provided to indicate incorrect answer.

Figure 4.8: First Slide showing an activity coming under the theme ‘Word Recognition’ (Sheet-1)

2.22 Sheet 2

Objective: - To assist pupil to read words representative of primary vocabulary.

The picture of ‘boy lying on the bed’ is shown. Student should fill the box showing action verb

i.e.,  fix  lie  lip  tip
2.3 Word Discrimination

It is the ability to match letters, words and recognise the difference between given letters and words.

**Objective:** - To develop accuracy in word discrimination

For eg: Matching Word Forms

**Barn**

- barn
- pran
- puar
- buar
- narb
- uarp

2.4 Picture Discrimination Skill

It is the ability to match and recognise the difference between given shapes and pictures.

**2.41 Match to Sample**

*Sheet 1*

**Objective:** - To help developing new discrimination skills.

Students have to look at the first picture in each row and mark the other picture in the row that just resembles it. Warning signal is also provided for incorrect answers.
2.42 Visual Discrimination Skills

It is the ability to match shapes, pictures, numbers and letters and recognise the difference between given shapes, pictures, numbers, letters and words. It is the ability to complete a sentence, with parts missing using appropriate word.

**Sheet 2**

**Objective:** - To develop proof reading skills

Some words are easily mistaken for other similar words. eg: ‘through’ ‘and ‘thorough’.

For eg: Read the following words and then answer the questions.

It looks like ‘quite’ but means the opposite of noisy ………………..

(quiet, shoulder, stripe, thought, bought)

2.5 Semantic web

Understanding the meaning of words is usually referred to as semantics. It is crucial both for the interpretation and for the appropriate use of language. It is the ability to obtain meanings from words, sentences and other word combinations.

**Objective:** - To strengthen student’s vocabulary as well as the student’s sense of relationship between concepts.
In this different water sources like ocean, river, glacier, springs can be represented in the form of a web. Any topic with various subdivisions can be represented in this way.

Figure 4.11: An example for the theme ‘Semantic Web’

2.6 Letter Groups

This test is designed to check the pupil’s ability to make words from given letter groups.

Objective: - To practise the creation of words from component letter groups.

Example: Replace the underlined letter group in the given word with the appropriate letter groups presented in brackets.

Construction [des/ in]………………..

2.7 Word patterns

This pattern helps the students to remember a series of words well enough so as to repeat them when needed.

Objective: - To organise children to master words.
2.8 Quizzes

These are statements in question form that helps to identify the ability to follow a series of instructions and to find the right answer.

**Objective:** To introduce new vocabulary and variety of expression.

For eg: Which month follows August?

2.9 Picture checking exercises:

These exercises may be used with pictures of different levels of complexity. Several picture checking exercises have proved to be useful in word study.

2.9.1 Sheet 1

**Objective:** To develop general reading ability.

In sheet 1, The picture of a big clock is given (Picture enclosed in appendix Q, frame no: 34). Students should place the cursor at the appropriate picture and click. Warning sign is provided for incorrect answers.

2.9.2 Sheet 2 (one picture and several words)

**Objective:** To identify appropriate word for the given pictures

For eg: Draw a line from the word to the object which shows the meaning of the word. The pictures of many words are enclosed in a single picture. Undo button is also provided to rub if the student makes an incorrect answer.
2.10 Assessing student progress

2.10.1 Word List

2.10.1.1 Activity 1

Frequently used words in reading are provided and students have to read it in a flexible manner.

2.10.1.2 Activity 2

A picture is given and he/she have to answer the question related to picture. For eg:- The picture of a dog eating something is given (Picture enclosed in appendix Q, frame no.36) and the student is asked to answer the question ‘who is eating?’. Warning signal provided for incorrect answer.

A cat □  A dog □  A boy □  A doll □

2.10.1.3 Activity 3

A picture showing various themes are provided and students have to answer questions related to those themes.

2.10.1.4 Activity 4 (Word finding activity)

Word identification is the ability to identify a printed symbol, retain it in memory and recall it later when it appears in a different context.

For eg. He/ She have to find out the word from the list given below that tell us from where we buy food

farm □  table □  store □  beach □
Phase – 3: Morphological Awareness

Morphology is the study of word formation. A morpheme is the smallest linguistic unit with meaning. It may be a prefix, suffix or root word. For example, the word dogs is composed of two morphemes- the concept of a dog and the concept of plurality’s’. Morphemic analysis also looks at grammatical markers such as tenses and person. Morphological Awareness can be built up with games where prefixes and suffixes are written on cards and attached to base words. Children get points for words they build from the component parts. Intervention directed at increasing knowledge of morphological syntactic structures can facilitate oral language as well as reading comprehension.

The names and purposes of 6 themes, their sub-themes, activities related to the themes and the appraisal activities used in the phase- three are described below.

3.1 Minimal Pairs

These are words where there is only one sound difference between the words. A collection of cards of minimal pairs which focus on consonants in initial position, consonants in final position and medial vowel contrasts are useful resources for the teacher, both for assessment procedures and for working on auditory discrimination.

Objective: - To access a child’s spoken language skills through informal assessment by auditory discrimination.

eg:    ran/ram    fin/thin
       boat/beat   sip/ship
       pin/bin     sheet/sheep

The sounds of these words are audio-recorded and students are asked to repeat it after listening.

3.2 Vowel- Consonant- ‘e’ rule

3.2.1 Sheet 1

Objective: - To become familiar with the words in rhyming groups.

eg: - cute /mute   complete /delete
3.2.2 Sheet 2

Objective: - To develop good reading habits by decoding unknown words.

- cap, cape
- dan, dane
- fat, fate etc

3.3 Prefixes and suffixes

Analysis of the structure of the words is used to identify root words and suffixes or prefixes. Prefixes and suffixes frequently change the meaning of a word and understanding this elaboration of word meaning is necessary in order to understand what is real.

Objective: - To capture interest of the child through learning small but meaningful bits of language.

3.3.1 Prefixes

Examples :- distrust, imperfect, inactive, misbehave etc.

3.3.2 Suffixes

Examples :- breakable, curable, forgetful, ageless, careless

3.4 Vertical column Arrangement of words

In this, the words are to be arranged in vertical columns so as to give emphasis to their common elements, distinctive characters and to require very precise perception of the word-forms.

Objective: To give emphasis to common element in words.

eg:

| bell | tell | sell | fell |

3.5 Parts of speech

Objective: - To provide meaningful prompts to term that can develop reliable memory traces that are sustainable over time.

Noun

A noun is a thing. A noun is an object

A ‘town’ is a noun. e.g. The town is big.
Proper noun

There are different types of noun. A ‘proper noun’ is the name of something. It always begins with a capital letter.

e.g: London is big.

Common noun

Another type of noun is a ‘common noun’. This is a noun that does not start with a capital letter, but it does not have to be a common word (the term ‘common’ is confusing).

e.g: He had never seen a computer before

Pronoun

A pronoun is in place of a noun. (When a professional footballer is injured, a substitute is put in his / her place)

e.g: He scored a goal. They cheered and we groaned.

Verb

A verb is a doing word

e.g: We viewed the sky through a telescope

Adjective

An adjective adds to the meaning of a noun.

e.g: We brought his dad an adjustable spanner.

Adverb

An adverb adds to the meaning of a verb

e.g: He closed the door quietly.

3.6 Assessing student progress

3.6.1 Activity 1

Find the words that end like ‘coat’

goat ☐ doll ☐ float ☐
boat ☐ clock ☐ gloat ☐

3.6.2 Activity 2

eg: The egg was laid by the

children ☐ citizen ☐ hen ☐
3.6.3 **Singular spelling of words**

*Activity 3*

Write down the singular form of the following.

eg: flies-----

3.6.4 **Variant endings/ Variant forms**

*Activity 4*

Select the right word

The cat -------- her milk

<table>
<thead>
<tr>
<th>drink</th>
<th>drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Phase-4: Reading Comprehension**

Comprehension of written material is a basic skill that heavily influences almost all aspects of educational achievement and students with learning disabilities demonstrate deficits in this crucial skill. Reading generally involves extraction of meaning from texts which are longer than one sentence. It may involve relatively simple comprehension of the joint meaning of several sentences, more complex comprehension such as understanding of paragraph structure and topic, sentences in paragraphs or understanding of story structure. Comprehension may be improved by the use of the imagination, if students are systematically taught how to create a visual image of the material that they are reading. There are two levels of comprehension needs: comprehension for casual or pleasure reading and comprehension for studying or acquisition of technical information. The first level of comprehension is usually that which is needed for reading a novel, magazine article or even reading an instruction or recipe. The second level of comprehension training is that which enables the individual to read for gaining technical information, analysis of literature, report writing and other skills needed for success in studies.

The names and purposes of 9 themes, their sub-themes, activities related to the themes and the appraisal activities used in the phase- four are described below.

**4.1 Sentence Construction**

**Objective:** To provide additional focus on subtle interaction of words and the differing needs of written rather than spoken language
For eg. Students are asked to draw lines to make meaningful sentences. Undo button is there to erase if an incorrect answer is made.

We left our umbrellas at home. behind.

4.2 Phrase checking exercises

In this case, a single picture illustrates one of the phrases or sentences.

4.2.1 *Sheet 1*

**Objective:** - To develop reading comprehension.

eg: Students should draw a line from the apt phrase to the picture. Undo button is provided.

![First slide showing an activity coming under the theme ‘Phrase Checking’ (Sheet 1)](image)

4.2.2 *Sheet 2*

Here students are asked to draw a line from the phrases given to the corresponding pictures shown in the diagram. Undo button is also provided.
4.3 Contrast Exercise

Objective: - To provide exercise in utilising the context in discovering the word’s meaning.

eg: Pictures of a long pencil and short pencil are shown.

4.4 Synonyms and antonyms

Objective: - To develop precise meanings.

4.4.1 Antonyms

Sheet 1

eg: Find the word that have opposite meanings

many

some □ no □ few □

Warning signal is provided to prevent incorrect answer.

4.4.2 Synonyms

Sheet 2

eg: Find the words that have similar meaning.

glow

bright □ shine □ spark □
4.5 Find connections

**Objective:** - To ensure that the meaning of words are understood

For e.g. Underline the words that share an ‘oa’ spelling pattern
cloak, stone, roast, cabbage, view, coast, climb, boat etc.

Undo button is provided to erase incorrect answers.

4.6 Choosing the odd one out

**Objective:** - To develop unpredicted association between words.

eg: Students are asked to underline the odd one out (according to meaning.)

rubbish   treasure   scrap   worthless

4.7 Auditory Discrimination

It is the ability to develop auditory skills through activities related to find
sounds of letters and identifying special words.

**Objective :-** To develop sustained attention and auditory memory.

A picture is given and students should colour each space that contain the
letter ‘d’ and they should name what is hidden in the picture.

![Figure 4.16: Slide showing a picture coming under the theme ‘Auditory Discrimination’](image)

4.8 Listening skills

**Objective :-** To develop listening skills along with memory skills.

For eg: Answer the following questions.

How many days are there in a week?.........................

Which month follows August?...............................
4.9 Assessing student progress

4.9.1 Meaningful Scanning

Activity 1

eg: Underline all the things that can run

<table>
<thead>
<tr>
<th>horse</th>
<th>house</th>
<th>girl</th>
<th>pig</th>
</tr>
</thead>
<tbody>
<tr>
<td>tree</td>
<td>dog</td>
<td>road</td>
<td>man</td>
</tr>
<tr>
<td>cat</td>
<td>boy</td>
<td>store</td>
<td>window</td>
</tr>
</tbody>
</table>

Activity 2

eg: Underline the odd one out (According to taste)

lemon sugar chocolate honey

4.9.3 Single Word Reading and comprehension

Activity 3

eg: Draw lines to match words on the right with those on the left.

| Africa | hot | Ice-cream | Iced tea |

4.9.4 Activity 4

A paragraph is given and students must fill the missing words (see appendix Q, frame no:- 52).

4.9.5 Activity 5

Students should read each sentence and pick up the correct picture which has the same meaning as that of the sentence.

eg: A girl putting flowers on the table.
Figure 4.17: First side showing an activity coming under the theme ‘Single Word Reading and Comprehension’

4.9.6 Activity 6

Students must read each phrase and pick up the correct picture which has the same meaning as that of the phrase.

eg:- A big table

Figure 4.18: Second slide showing a picture coming under the theme ‘Single Word Reading and Comprehension’
4.9.7 Picture comprehension exercise

Activity 7

Students are asked to observe the picture carefully and answer the questions. (See appendix Q, frame no. 53).

4.9.8 Paragraph comprehension exercise

Activity 8

Students must read the paragraph given and fill in the blanks suitably.

![Figure 4.19: Slide showing an activity coming under the theme ‘Paragraph Comprehension’](image)

4.99 Cloze procedure

Activity 9

Students should complete the structured cloze procedure by filling the blanks.

Stage- Three: Evaluation (5 hrs)

This is the final stage in the implementation of the Multimedia Package. By evaluation, we mean a process that focuses on continuous improvement rather than just a “pass - fail” test in which individuals associated with a programme win or lose credibility. When an evaluation suggests that a programme falls short in achieving its goals, it should not be used to punish an individual or group. Rather,
it should be used as a guide for improving the training that is offered. Evaluation should be linked to learning and the continual pursuit of quality.

In this study, immediately after the training stage, RMI, RAT and delayed RAT were administered again as post-tests and retention test to find out the effectiveness of the Package. The data obtained were analysed for deriving the conclusion on the effectiveness of Multimedia Package in minimising the Dyslexic symptoms.

4.4.8.5 Administration of the Multimedia Package

The Multimedia Package was administered among 76 Dyslexic students studying in 5th and 6th standards of sixteen schools in Ernakulam district. Before the implementation of the Package, the level of reading errors were assessed using RMI & RAT as pre-tests. The investigator developed an awareness among parents and teachers of various schools about the special needs of the identified sample. The Multimedia package designed mainly focuses on the learning style of students and their reading errors. The investigator developed an awareness among parents and teachers of various schools about the special needs of the identified sample. The investigator thus confirmed the co-operation of teachers and parents in the execution of all the phases of MMP. Students were given training with the help of English teachers, IT teacher and resource teachers (available only in Aided schools) and evaluated their improvement in reading using RMI, RAT as post-tests and delayed RAT as retention test.

4.4.9 Package Evaluation Proforma for Experts.

This tool was prepared for checking the effectiveness of the Multimedia Package by experts. It consists of 15 statements and experts were instructed to read each statement carefully and write down their opinion in “Yes” or “No” format. The tool was also validated with the same team of experts who have validated the MMP. The Package Evaluation Proforma was given to the experts before the implementation of the Package, for the successful development of the same. Some of the representative items given in the Proforma are described below:

- The different phases in the Package are arranged in good sequence. (Yes/No)
- The Multimedia Package is matching with the present curriculum /syllabus of the primary classes. (Yes/No)
• The Multimedia Package can be recommended for the general application as part of the formal education. (Yes/No)

(The package evaluation Proforma for experts is given in Appendix O)

4.4.9.1 Administration of the tool

A Package Evaluation Proforma was administered among the 20 experts who have validated the Multimedia Package. They were instructed to suggest their opinion on different aspects of the Package for making necessary modifications.

4.4.10 General Data Sheet

All students were given a general data sheet to know their name, gender, class, locale, economic status, permanent address, type of family they belongs, literacy of parents, type and nature of the school in which he/she studied(The general data sheet format is given in the appendix P).

4.5 Statistical Techniques used for the Study

• Computation of Percentage.
• Test of Significance of difference between means – Paired ‘t’.
• Analysis of Variance (ANOVA).
• Analysis of Co-Variance(ANCOVA).
• One-way Repeated Measures ANOVA and
• Paired Multiple Comparison with Sidak Correction.