CHAPTER 3

RESEARCH DESIGN

3.1 INTRODUCTION

Research in the field of education must be related to the problems experienced by the teachers in the day-to-day life. After selecting the problem, the investigator should develop a plan to carry out the research process efficiently which is called as Research Design. When people go to a new place, using sign board to reach the place is important. Likewise, researchers have to develop a Research Design to carry out the process effectively. The investigator’s responsibility should be like a sailor, that means the investigators must be very careful during the process of investigation to conquer the hurdles in the way. Method of study to be adopted, Sampling techniques to be used, Number of Samples to be taken, Variables to be defined, Objectives of the study, Hypotheses are to be verified and statistical techniques to be followed and all parameters must be clearly defined before starting the research process. Hence, in this chapter the investigator tried to explain all the above necessary information as Research Design.

3.2 RESEARCH QUESTIONS

- Are there any Vision Defective students in schools without knowing their problem?
- Is there any difference in prevalence of Refractive error regarding Gender, Residential Area and Type of management of school?
- Can the investigator discover the association if any among students vision with respect of their democratic variables?
Can the investigator locate any difference in the Reading Ability, Writing Ability Letter Identification and Academic achievement (Percentage of marks scored by the students in all the subjects) of Normal and Vision Defective Students?

Can the investigator find any difference in the Reading Ability, Writing Ability Letter identification and Academic achievement of Control Group students after a period of seven months?

Can the investigator come across any difference in the Reading, Writing Ability and letter identification of vision defective students with and without eyeglasses?

Can the investigator distinguish any difference in the Reading Ability, Writing Ability Letter identification and Academic achievement (Percentage of marks scored by the students in all the subjects) of Experimental group students after seven months of wearing eye Glasses?

Will there be any impact of Refractive Error on educational performance of VII std students with respect to
A. Reading Ability
B. Writing Ability
C. Letter Identification and
D. Academic achievement (Percentage of marks scored by the students in all the subjects)?

Will there be any improvement in educational performance of VII std students after correction of Refractive Error with respect to
A. Reading Ability
B. Writing Ability
C. Letter Identification and
D. Academic Achievement (Percentage of marks scored by the students in all the subjects)?
3.3  **OBJECTIVES OF THE STUDY**

3.3.1  **Major Objectives**

1. To discover the association if any among students vision with respect of their important demographic variables.

2. To compare the educational performance of normal students with vision defective students in respect of their
   A. Reading Ability
   B. Writing Ability
   C. Letter Identification and
   D. Academic Achievement (Percentage of marks scored by the students in all the subjects)

3. To find out the impact of Refractive Error on educational performance of VII std students with respect to
   A. Reading Ability
   B. Writing Ability
   C. Letter Identification and
   D. Academic Achievement (Percentage of marks scored by the students in all the subjects)

4. To explore the impact of corrected Refractive Error on educational performance of VII std students with respect to
   A. Reading Ability
   B. Writing Ability
   C. Letter Identification and
   D. Academic Achievement (Percentage of marks scored by the students in all the subjects)
3.3.2 Specific Objectives

1. To explore the percentage of vision defective students and to focus on the prevalence of refractive error regarding Gender, Residential area and type of management of school.

2. To discover the association if any among students Refractive Error with respect of their
   A. BMI
   B. Mother’s Educational Qualification
   C. Father’s Educational Qualification
   D. Monthly Income of the Family
   E. Heredity (Parental glass history) and
   F. Environment (Near Work and Outdoor Activities)

3. To estimate the difference between Normal and Vision defective students with respect of their
   A. Reading Ability
   B. Writing Ability
   C. Letter Identification and
   D. Academic Achievement (Percentage of marks scored by the students in all the subjects)

4. To identify the difference, before and after a period of seven months of control group students in respect of their
   A. Reading Ability
   B. Writing Ability
   C. Letter Identification and
   D. Academic Achievement (Percentage of marks scored by the students in all the subjects)
5. To study the difference, before and immediately after providing eye glasses of Experimental Group students in respect of their
   A. Reading Ability
   B. Writing Ability and
   C. Letter Identification

6. To investigate the difference, before and after correction of refractive error (after seven months) of Experimental group students with respect of their
   A. Reading Ability
   B. Writing Ability
   C. Letter Identification and
   D. Academic Achievement (Percentage of marks scored by the students in all the subjects)

### 3.4 HYPOTHESES OF THE STUDY

**H1** - Distribution pattern of Refractive Error among VII standard students with respect to the following variables is normal in nature.

- **H1-A** Magnitude of Refractive Error in General
- **H1-B** Gender
- **H1-C** Residential Area and
- **H1-D** Type of management of school

**H2** - There is no significant association between student’s Refractive Error and their

- **H2-A** BMI
- **H2-B** Mother’s Educational Qualification
- **H2-C** Father’s Educational Qualification
- **H2-D** Monthly Income of the Family
H2-E Heredity (Parental glass history) and

H2-F Environment (Near Work and Outdoor Activities)

H3 - There is no significant difference between Normal and vision defective students in respect of their

H3-A1 & A2 Reading Ability
H3-B1 & B2 Writing Ability
H3-C1 & C2 Letter Identification and
H3-D Academic Achievement (Percentage of marks scored by the students in all the subjects)

H4 - There is no significant difference between before and after a period of seven months of control group students in respect of their

H4-A1 & A2 Reading Ability
H4-B1 & B2 Writing Ability
H4-C1 & C2 Letter Identification and
H4-D Academic Achievement (Percentage of marks scored by the students in all the subjects)

H5 - There is no significant difference between before and immediately after wearing glasses of Experimental Group students in respect of their

H5-A1 & A2 Reading Ability
H5-B1 & B2 Writing Ability and
H5-C1 & C2 Letter Identification

H6 - There is no significant difference between before and after (seven months) correction of vision defects of experimental group students in respect of their

H6-A1 & A2 Reading Ability
H6-B1 & B2 Writing Ability
3.5 EMERGENCE OF THE PROBLEM

Many studies in the field of medicine, regarding prevalence of vision problem among students, say that, the problem in vision is also one of the reasons for poor educational performance. Hence the investigator has a quest to examine whether the educational performance depends on vision or not? And the investigator also interested to know the percentage of students with uncorrected vision problem in schools. A pilot study was conducted by the investigator in the month of November 2009. Age 11 and 12 are a transitional period from childhood to Adolescence. It is also called preadolescence stage. In this stage both physiological and psychological changes occurs rapidly. At age 11 the students will be studying in sixth standard. Students have shifted from primary school to High school. Psychologically the students may not be ready to conduct this type of research. And one more reason for selecting VII standard students is the personal experience of the investigator is that the investigator’s daughter has got the same problem at her age 12. Hence the investigator selected the VII standard students as samples for the research work. During the pilot study (Nov-2009), the percentage of vision defects among VII standard students in the same Government school was 30%. Now, that is exactly after 7 months it has reached 38%. The problem chosen for the study has been entitled as “Impact of Refractive Error Correction on Educational Performance of VII std Students in Kanchipuram District”.

3.6 VARIABLES INVOLVED IN THE STUDY

3.6.1 Independent Variable

Refractive error
3.6.2 **Dependent variables**

Educational performance

- Reading Ability
- Writing Ability and
- Letter Identification
- Academic Achievement (Percentage of marks scored by the students in all the subjects)

3.6.3 **Instrumental Variables**

Snellen Chart

Eye Glasses

3.6.4 **Demographic Variables**

Gender

Mother’s Educational Qualification

Father’s Educational Qualification

Monthly Income of the Family

Heredity (parental glass history) and

Environment (Near work, Outdoor Activities).

3.7 **OPERATIONAL DEFINITIONS OF TERMS**

3.7.1 **Refractive error**

A refractive error or refraction error is an error in the focusing of light by the eye and a frequent reason for reduced visual acuity [76].
An error in refraction of the eye. An optical defect in an unaccommodating eye in which parallel light rays do not focus sharply on the retina [77].

The degree to which the natural refraction of the eye is imprecise. This natural error is the result of the focal point of the image not falling precisely on the curve-linear plane of the retina [78].

3.7.2 Educational Performance

In this investigation, the Educational performance is referred as Reading Ability, Writing Ability, Letter Identification and academic achievement (Percentage of marks scored by the students in all subjects) of students.

3.7.3 Reading ability

Reading ability is a restricted but general skill whose main characteristic is the construction of restricted linguistic representations.

Reading fluency: the rate with which individuals can name words.

Reading accuracy: the ability to correctly name a word on a page.

In this study Reading Ability of the students was measured by involving them to read a passage, the time taken to complete the passage (speed) and number of mistakes made by the students were carefully noted by the researcher individually. This test was conducted before providing Glasses and after a period of seven months also for both Control and Experimental Groups to measure the effectiveness of Refractive error correction.

3.7.4 Writing ability

The act or art of forming letters and characters on paper, or other material, for the purpose of recording the ideas which characters and words express, or of communicating them to others by visible signs.
In this study the Writing ability of the students was measured by allowing them individually to write the five letter words which has been written in a chart hanged at the wall. The written sheets were collected to measure the number words they have written in the given time and the number of mistakes made by them. The same test was repeated after a period of seven months for both Control and Experimental Groups to measure the effectiveness of Refractive error correction.

3.7.5 Letter Identification

It refers to the ability of the students to identify the any referred letter which is in a group.

In this study, the students were asked to cross out the letter ‘p’ in a sheet full of alphabets which were typed in an irregular manner (ie Not in an order from A to Z) and also without any space. It is an eye strain work performance.

3.7.6 Academic achievement

Academic achievement can be defined as excellence in all academic disciplines, in class as well as extracurricular activities. It includes excellence in sporting, behavior, confidence, communication skills, punctuality, assertiveness, Arts, Culture, and the like [79].

But in this investigation, only the percentages of marks scored by the students in all the subjects were considered as academic achievement.

3.7.7 Snellen Chart

A Snellen chart is an eye chart used by eye care professionals and others to measure visual acuity. Snellen charts are named after the Dutch ophthalmologist Hermann Snellen who developed the chart during 1862.
3.7.8 **Eye Glasses**

Eye glasses have a type of lens that can produce sharper, brighter and clearer eyesight for individuals with various vision problems.

3.7.9 **Gender**

Gender is used interchangeably with "sex" to denote the condition of being male or female.

3.7.10 **Residential Area**

It refers to that the location of student’s residence either Rural or Semi-urban.

3.7.11 **School Management**

This refers to the school managed by Government or privately by an individual.

3.7.12 **BMI**

The Body Mass Index (BMI) is a measure of the body weight relative to height which can be used to determine if we are underweight, normal weight, overweight or obese. BMI indicates we are

- Underweight for BMI less than **18.5**
- Normal for BMI **18.5 – 22.9**
- Overweight for BMI **23.0 – 24.9**
- Obese for BMI **25.0** and above.
Formula:

\[
\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}
\]  

(*In India, Normal BMI is less than 23, Overweight is above 23 and Obese is above 25 as per revised values by the Health Ministry in 2008).

3.7.13 Mother’s Educational Qualification

It refers to the level of education got by student’s mother such as illiterate or up to Higher Secondary or Under Graduates or Post Graduates.

3.7.14 Father’s Educational Qualification

It refers to the level of education got by student’s father such as up to Higher Secondary or Under Graduates or Post Graduates.

3.7.15 Monthly income of the Family

It refers to the money earned by the family members in a month.

3.7.16 Heredity (Parental Glass History)

Heredity (or inheritance) is the passing of traits to offspring (from its parent or ancestors). This is the process by which an offspring cell or organism acquires or becomes predisposed to the characteristics of its parent cell or organism.

In this study the investigator collected the information about either or both the parents wearing glasses or not.

3.7.17 Environment (Near work, Outdoor Activities)

Near work – In this study the near work of students considered as time duration they are spending for watching Television, working in computers and
reading books (other than subject). But in this study, there was no response in the space provided that the time they are spending for reading books per day. Hence the investigator took only the time they are spending for watching TV and working in computer as Near work.

**Outdoor Activities** – In this study the time they spent for outdoor activities such as playing any games after school time.

### 3.8 SAMPLES AND DISTRIBUTION

Research is done to find a solution to a particular problem based on statistics. In an ideal situation, the entire population should be studied but this is almost impossible for Research Scholars. Other than census, which is conducted on each and every person of the population, all other studies are performed on limited subjects drawn from the concerned population known as “Sample Population”. The importance of sample size calculation cannot be overemphasized. A research can be conducted for various objectives. Whatever be the aim, one can draw a precise and accurate conclusion only with an appropriate sample size. Sample size calculation should be done at the time of planning a study, based on the type of the research question and study design.

Fourteen Blocks are there in Kanchipuram District. Kattankulathur is one of the Block in Kanchipuram District. In which there are 55 Government schools and 37 Private schools are with upper primary (class VI to VIII) classes. From which the investigator selected one Government and one Private school for the investigation which is located in Maraimalai Nagar, Kattankulathur Block, Kanchipuram District.

Sixty eight students from Government Higher Secondary School VII Standard Maraimalai Nagar and fifty eight students from St Joseph’s Matriculation Higher secondary school VII standard Maraimalai Nagar were selected for the study by purposive Random sampling method. In Government school out of Sixty eight students 26 of them are having vision problem. From which 13 of them are
interested in wearing glasses. Hence they have included in Experimental group. One student was wearing glasses already. She has exempted from sampling. The remaining 12 students were considered as control group. In the same way, in private school out of fifty eight, 23 of them were identified as vision defective students. From which 13 of them were included in experimental group. Two of them were already wearing glasses. The remaining eight students were included in control group. Both the schools are located in semi urban area nearly one kilometer is the distance between those two schools.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students screened</td>
<td>126</td>
</tr>
<tr>
<td>No. of students with Good Vision</td>
<td>77</td>
</tr>
<tr>
<td>No. of students with Refractive Error</td>
<td>49 49-03=46</td>
</tr>
<tr>
<td>No. of students eliminated who wore glasses</td>
<td>03</td>
</tr>
<tr>
<td>Total No. of Samples</td>
<td>123</td>
</tr>
<tr>
<td>No. of Students drawn in Experimental Group (Supplied Eye glasses group)</td>
<td>26</td>
</tr>
<tr>
<td>No. of Students obtainable for Control Group (Defective but no glasses group)</td>
<td>20</td>
</tr>
<tr>
<td>Number of students with Refractive Error</td>
<td>46</td>
</tr>
</tbody>
</table>
Distribution of samples

Table 3.1 Distribution of the samples based on Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>53</td>
<td>43 %</td>
</tr>
<tr>
<td>Girls</td>
<td>70</td>
<td>57 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.1 Distribution of the samples based on Gender
Table 3.2 Distribution of the samples based on Residential Area

<table>
<thead>
<tr>
<th>Residential Area</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>66</td>
<td>53.6 %</td>
</tr>
<tr>
<td>Semi Urban</td>
<td>57</td>
<td>46.4 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

![Figure 3.2 Distribution of the samples based on Residential Area](image)

Figure 3.2 Distribution of the samples based on Residential Area
Table 3.3 Distribution of the samples based on School Management

<table>
<thead>
<tr>
<th>School Management</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government School</td>
<td>67</td>
<td>54.4 %</td>
</tr>
<tr>
<td>St.Joseph’s Mat.Hr.Sec.School</td>
<td>56</td>
<td>45.6 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.3 Distribution of the samples based on School Management
Table 3.4 Distribution of the samples based on BMI Group

<table>
<thead>
<tr>
<th>BMI Group</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Weight</td>
<td>47</td>
<td>38.2%</td>
</tr>
<tr>
<td>Under Weight</td>
<td>58</td>
<td>47.2%</td>
</tr>
<tr>
<td>Over weight</td>
<td>18</td>
<td>14.6%</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Figure 3.4 Distribution of the samples based on BMI Group
Table 3.5 Distribution of the samples based on Mother’s Educational Qualification

<table>
<thead>
<tr>
<th>Mother’s Educational Qualification</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non literate</td>
<td>16</td>
<td>13.0 %</td>
</tr>
<tr>
<td>Up to H.Sc</td>
<td>81</td>
<td>65.9 %</td>
</tr>
<tr>
<td>UG</td>
<td>20</td>
<td>16.3 %</td>
</tr>
<tr>
<td>PG</td>
<td>6</td>
<td>4.9 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.5 Distribution of the samples based on Mothers’ Educational Qualification
Table 3.6 Distribution of the samples based on Father’s Educational Qualification

<table>
<thead>
<tr>
<th>Father’s Educational Qualification</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to H.Sc</td>
<td>61</td>
<td>49.6 %</td>
</tr>
<tr>
<td>UG</td>
<td>41</td>
<td>33.3 %</td>
</tr>
<tr>
<td>PG</td>
<td>21</td>
<td>17.1 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.6 Distribution of the samples based on Father’s Educational Qualification
Table 3.7  Distribution of the samples based on Monthly Income of the Family

<table>
<thead>
<tr>
<th>Monthly Income of the Family</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Rs.5000</td>
<td>43</td>
<td>35.0 %</td>
</tr>
<tr>
<td>Rs.5000-10,000</td>
<td>53</td>
<td>43.0 %</td>
</tr>
<tr>
<td>Above Rs.10,000</td>
<td>27</td>
<td>22.0 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.7 Distribution of the samples based on Monthly Income of the Family
Table 3.8 Distribution of the samples based on Heredity (parental glass history)

<table>
<thead>
<tr>
<th>Parental glass history</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wearing Glasses</td>
<td>21</td>
<td>17.1 %</td>
</tr>
<tr>
<td>Not Wearing Glasses</td>
<td>102</td>
<td>82.9 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.8 Distribution of the sample based on Heredity (parental glass history)
Table 3.9 Distribution of the samples based on Near work/day in hrs

<table>
<thead>
<tr>
<th>Near work/day in hrs</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2 hrs</td>
<td>85</td>
<td>69.1 %</td>
</tr>
<tr>
<td>More than 2 hrs</td>
<td>38</td>
<td>30.9 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.9 Distribution of the samples based on Near work/day in hrs
Table 3.10 Distribution of the samples based on Outdoor activities/day in hrs

<table>
<thead>
<tr>
<th>Outdoor activities/day in hrs</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2 hrs</td>
<td>73</td>
<td>59.3 %</td>
</tr>
<tr>
<td>More than 2 hrs</td>
<td>50</td>
<td>40.7 %</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

Figure 3.10 Distribution of the samples based on Outdoor Activities/day in hrs
3.9  METHOD OF STUDY

A research design is the understanding of circumstances for collection and analysis of data in a mode that aims to combine consequence to the research purpose.

For this study the investigator has selected only VII std students from one Government and one Private school by convenient sampling method. All the students were subjected to vision screening. From that only the vision defective students were selected for Experimental and Control Group. The remaining students were also taken as sample for this study to get relevant information to make the study effective. For this research, the investigator adopted experimental method of study.

**Experimental Design:** For experimental study, the investigator collected all the vision defective students for research process. This study based on the Two-Parallel group design ie one Experimental group and another Control group. For experimental group, the students were selected only after getting consent from their parents for undertaking medical checkup and use spectacles if needed. The remaining students were considered as Control group. The numbers in these two groups are not equal. Because, many students were interested in wearing glasses hence the investigator cannot avoid any particular student. The achievement marks in 1st mid-term test of all the students were carefully collected and categorized by the investigator. The Reading Ability, Writing ability and Letter identification of all the students were measured and is has been considered as pre test.

Eye glasses were provided only to the Experimental group students in the month of August 2010. The Control group students were left as such without any treatment. Reading Ability Writing Ability and letter identification tests were conducted for the Experimental group students at the time immediately after wearing the Eye glasses. In-between the investigator visited the schools and confirmed that the students of Control group were not wearing glasses by personal effort and Experimental group students are wearing glasses regularly.
After a period of seven months the investigator conducted necessary tests and collected the marks of 3rd mid-term tests which were conducted in the month of March 2011 of both Control and Experimental groups. The difference between Educational performance of students in the month of July 2010 (pre-test) and in the month of March 2011 (post-test) were analyzed by using proper statistical method.

3.10THE PROCESS OF INVESTIGATION

A Pilot study was conducted by the investigator in the months of October and November 2009 (Certificates given by the head of the schools were enclosed in Appendices). Because without previous experience, we cannot expect any practical problems that we may face during real research period. Hence the investigator visited four schools such as two Government and two private schools with an experienced Optometrist. Vision screening was made for VII standard students of each school. Then the investigator met some parents of each school to know their interest in sending their wards to the Hospital for Vision check up and free eye glasses for them.

Finally in the month of July 2010, the investigator selected only two schools for final research work and visited the schools with the permission of school Heads. Confirmation was made that there are no students with learning disability. Since if any child with learning disability such as problem in visual perception or problem in auditory perception they must be avoided for this research work. The vision screening was made by an experienced Optometrist in respective class rooms itself. At the same time, with the help of Research Assistants (M.Phil and M.Ed Scholars) Height, Weight, Reading ability, Writing ability and ability of identifying letters in alphabet of students were measured carefully by the investigator. Percentage of marks secured by the students in all subjects were collected by the investigator from the Class teacher of respective classes. And then, the personal data sheets comprising of all necessary details about the students and parents were given to all the students with a request that it should be filled with assistance of their parents. The next day, those sheets were collected by the Researcher. Appeal letters
were also distributed to the parents of students who need to wear glasses. For experimental study the investigators needs around 25 students for each group (Control and Experimental group). After getting permission from parents and also from school Heads, the Researcher brought the Vision defective children to the Hospital which is located nearby schools. Twenty six students were able to visit the Hospital constituted as experimental group. Five parents also came along with their wards to the Hospital. In Hospital, a group (5 Doctors) of Ophthalmologists made a thorough check up for all the children, and suggested the glasses they need to wear. Some students need second visit to finalize their glasses. The Doctors advised the students about the procedures to be followed to wear the Glasses. The investigator has collected the prescriptions to order the glasses for the children. In the month of August the investigator collected the glasses, and visits the schools and handed over the glasses to the students. When the Researcher providing glasses to the respective students, the investigator has also advised them about the proper using of Glasses and food items to be taken for better eye sight. Many of the parents, all the students and other members in the schools were appreciated and thanked the Researcher for the contribution and interest in Research.

3.11 TOOLS USED FOR THE STUDY

Personal Data sheet, Schedule, Tools to measure Reading ability, Writing ability and Letter identification were used as Tools for the study.

**Personal Data Sheet** prepared by the investigator to collect the relevant data about the students, and it was distributed to the students. Request was made that, the personal data sheets to be filled by their parents, because the students (average age 12 yrs and 6 months) are not matured enough to fill all the details such as economic status, parent’s educational qualification etc.

**A schedule** was also prepared by the investigator to note height, weight, achievement marks and other necessary details of the students.
A print out of a **story** and a **chart** containing five letter words were also used to measure the reading and writing ability of the students respectively. A **print out** of haphazardly typed letters of alphabet (that is not in the order from a to z and also no space between each letter) was also distributed to cross out the letter ‘p’. All these three tools were validated by consulting with well experienced Teachers who are handling classes for VII standard students, and Ophthalmologists for finalizing the size of the letters and the type of letters to be repeatedly included. Vision defective students are making confusion in the letter ‘b’ with ‘d’ and ‘p’ with ‘q’ even though they don’t have the problem of learning disability. Ophthalmologists also said that, this is because of defects in the vision. Hence the investigator showed interest in conducting this type of experimental research.

### 3.12 ANALYSIS OF DATA

All the Hypotheses framed for the present study were tested by using the following appropriate statistical techniques.

- Percentage Analysis
- Mean
- Standard deviation
- Chi-Square Analysis and
- The ‘t’ test

### 3.12.1 Chi-Square Analysis

A parameter is a population score, where as a statistics is a score for a sample randomly drawn from the population. Parametric statistics make certain assumption about population parameters. One assumption is that the scores in the population are normally distributed about the mean; another assumption is that the population variances of the comparison groups in one’s study are approximately equal. When large deviations from these assumptions are present in the research data, parametric statistics should not be used. Instead, one of the “nonparametric statistics” should be selected.
Chi-square is a nonparametric statistical test that is used when the research data are in the form of frequency counts. These frequency counts can be placed into two or more categories [80].

The chi-square test tells you whether the two independent samples have significantly different distributions across the two categories and may thereby be considered to have been drawn from different populations. That is, it tells you whether the frequencies obtained in the cells of the table are different from the frequencies you might expect based on chance variation alone. Thus, the chi-square test compares obtained frequencies to expected frequencies and indicates the probability that they are different. Occasionally, it is necessary to transform a variable from interval measurement to nominal measurement in order that both variables be nominal –making the use of chi-square possible [81].

The basic formula for computing chi-square is as follows

\[ X^2 = \sum \frac{(o-e)^2}{e} \] (3.2)

O is the obtained frequency in a cell and e is the expected frequency.

### 3.12.2 The ‘t’ Test

“The ‘t’ test is a statistical test that allows the researcher to compare two means to determine the probability that the difference between the means is a real difference rather than a chance difference”.

The test of significance of the difference between the two means is known as the ‘t’ test. It involves the computation of the ratio between the experimental variance (observed difference between the two sample means) and the error variance (the sampling error factor).

\[
t = \frac{M_1 - M_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}} = \frac{\text{Experiment Variance}}{\text{Error Variance (sampling error)}}
\] (3.3)
where, $M_1$ - Mean score of the first Group
$M_2$ - Mean score of the second Group.

$\sigma_1$ - Standard Deviation of the first Group
$\sigma_2$ - Standard Deviation of the second Group.

$N_1$ - Size of the first Group
$N_2$ - Size of the second Group

The computed ‘t’ value is compared with the values of ‘t’ given in the ‘t’ table at the appropriate degree of freedom and at required level of significance. If the calculated ‘t’ value is greater than or equal to the table ‘t’ value then the difference between the sample means is significant at that level of significance.

**Level of significance:** In psychological and educational circles the 5 percent (0.05) alpha level of significance is used as a standard for rejection. Rejecting a null hypothesis of 0.05 level indicates that a difference in means as large as that found between pre test and post test of experimental and control Group means would not likely have resulted from sampling error in more than 5 out 100 replications of the study. This suggests 95 percent probability that the difference was due to the experimental treatment rather than to sampling error.

A more rigorous test of significance is the one percent (0.01) level. Rejecting a null hypothesis at the 0.01 level would suggest that as large as a difference between the pre test and post test of experimental and control mean achievements would not likely have resulted from sampling error in more than one in 100 replications of the experiment [82].

### 3.13 DELIMITATIONS OF THE STUDY

- In this study, the Control and Experimental group students are not Homogeneous in number as well as in their Abilities. Because the investigator could not avoid the students who were interested in
wearing glasses. Hence the number of students in Experimental Group is higher than the Control Group.

- There is no separate test was conducted by the investigator to get achievement marks. Marks for pre test and post test were collected from the experienced class teachers only.
- Only the VII std students were selected for the study.
- Only two schools were selected in Maraimalai Nagar for the study. Because the vision defective children must be taken to SRM Hospital. So the schools should be nearby to the SRM Campus.
- Since it is an Experimental Research, the sample size was limited to 123 only, the investigator has to pick up and drop the Experimental Group students (26) in proper time.

### 3.14 CONCLUSION

Of all the five senses, sight is the most precious. Hence, care and preservation of eyesight should be the foremost concern of every human being. The Times of India dated October 11, 2007, portrayed India as home to the world’s largest number of visually impaired people. Of the 37 million people across the globe who are blind, over 15 million are from India. While India needs 40,000 optometrists, it has only 8,000. A majority of cases of blindness occurs during infancy and childhood. It is, however, reassuring that about two-thirds of cases of blindness in India are curable, if detected and treated early. As children below the age of 15 constitute about 40 per cent of our total population and a vast majority of them are now attending schools, there is an imperative need to concentrate on this group to detect eye problems. They could be examined for all possible defects in vision and provided timely medical help to reduce the incidence of preventable blindness. Failing this, the eye defects in school children might lead to blindness. Thus detection and treatment of poor eyesight is essential at childhood stage.

The analysis and interpretation of data along with a description of testing of the spelt-out hypotheses are presented in the next chapter.