CHAPTER V
EXPERIMENTAL DESIGN

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5.1 Introduction

In order to study the performance in Reading Comprehension in relation to some variables, an experiment was conducted in three schools of Kambhat city. This experiment was pertaining to the application of various strategies meant for improving the Reading Comprehension of the pupils in context of certain variables.

There are different methods of experimentation, namely, one group method, equivalent group method or parallel group and rotation group techniques.

Out of these three methods, the equivalent group method has been selected as the study not only aims at implementing Reading Programmes but also aims at studying their performance that is comparing the achievement of students learning through various strategies with the achievement of students learning by means of the traditional method.

In the schools under consideration, one class was selected from each school. There were four classes in this experiment.
The investigator kept the following objectives and hypotheses in view while planning the experimental design.

5.2 Objectives and Hypotheses

Objectives

The objectives of this investigation are as follows:

1. To analyse the syllabus of English for Std. IX in terms of teaching points and vocabulary items.
2. To decide the entering behaviour of the group.
3. To determine the terminal behaviour of the group.
4. To develop the Reading Programmes for improving the comprehension power of the students.
5. To implement the Reading programmes through various strategies.
6. To study the performance of the students' comprehension of the read material in context of certain variables viz., study habits, socio-economic status and Intelligence Quotients of the students.

With a view to studying the performance of Reading Comprehension programmes in relation to certain variables, the following hypotheses were established and tested.
Hypotheses

1. The total mean score achieved by the experimental groups taught by means of the three strategies viz., Request procedure, REAP technique and Guided Reading procedure is greater than that of the control group taught through the conventional method.

2. The students having good and poor study habits will benefit to a great extent due to the execution of the strategies.

3. Students with high S.E.S. as well as low S.E.S. will benefit more from the implementation of the strategies meant for improvement.

4. Students possessing higher Intelligence Quotients as well as those possessing low Intelligence Quotients will reap the benefit from implementation of the Reading programmes.

5.3 Selection of the Sample

The selection of the sample of the students in schools is of vital significance, in the experimental type of research. It was a representative sample of 250 students but because of an early departure from their destined goal there were left only 160 students, studying in Std. IX of the three secondary schools. The secondary schools of
In the beginning of the year, the reading comprehension test form-A, vide Appendix A, was administered to all selected classes as a pre-test. The test scores were used to make the equally matched groups. Thus the four matched groups have been formed. From these four matched groups three have been selected randomly as experimental groups and one as a control group.

Mean and S.D. of scores made by the students of the experimental groups and control group in initial test (Entering Behaviour Test) pre-test (as shown in table 5.1)

Table 5.1

<table>
<thead>
<tr>
<th>Name of the Schools</th>
<th>Group</th>
<th>Mean</th>
<th>Mean difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.J. High School</td>
<td>Control</td>
<td>29.5</td>
<td>0.9</td>
</tr>
<tr>
<td>S.D.K. High School</td>
<td>REAP</td>
<td>30.4</td>
<td>0.75</td>
</tr>
<tr>
<td>S.K. Vaghela High School</td>
<td>Request</td>
<td>28.75</td>
<td>1.6</td>
</tr>
<tr>
<td>S.D. Kapadia High School</td>
<td>GRP</td>
<td>31.10</td>
<td></td>
</tr>
</tbody>
</table>

From the above table, it is seen that mean differences between the groups i.e. control and REAP, control and Request procedure and control and Guided Reading procedure are 0.9, 0.75 and 1.6 respectively. The mean differences are
very small. So it can be concluded that all the four groups are about equal in respect to calibre.

All the groups including control group as well as the three experimental groups viz., REAP, Request Procedure and Guided Reading Procedure group have 40 pupils each (see table 5.2).

Table 5.2
NUMBER OF PUPILS OF THE CONTROL AND THE EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of the School</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S.D. Kapadia High School</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>S.D. Kapadia High School</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>S.K. Vaghela High School</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>Municipal Jubilee High School</td>
<td>40</td>
</tr>
</tbody>
</table>

5.5 Tryout and Selection of the Final Test Items for the Entering Behaviour Test as well as the Terminal Behaviour Test

For five passages, five test-clusters were prepared. There were 3 test clusters for the first passage, 3 for the second, 3 for the third passage, 3 tests for the fourth one and four tests for the fifth passage. There were 16 such tests having a good variety of items. These tests were
given to the pupils of various schools and time was noted. (See table 5.3) It was analysed and the most difficult items which could not find place in the answers were omitted. Easiest items which were answered by everybody were dropped. Thus, this test was made adequate to cater to the calibre of average pupils.

Table 5.3
THE PUPILS COVERED IN THE PRE-TEST FOR FINALISING THE ITEMS OF THE ENTERING BEHAVIOUR TEST

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of the school</th>
<th>Number of pupils</th>
<th>Time taken minutes</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Swaminarayan High School Metpur</td>
<td>30</td>
<td>13</td>
<td>23-8-84</td>
</tr>
<tr>
<td>2</td>
<td>S.Z. Vaghela High School Kambhat</td>
<td>30</td>
<td>12</td>
<td>13-9-84</td>
</tr>
<tr>
<td>3</td>
<td>S.Z. Vaghela High School</td>
<td>30</td>
<td>10</td>
<td>13-9-84</td>
</tr>
<tr>
<td>4</td>
<td>Madhavlal Shah High School</td>
<td>30</td>
<td>10</td>
<td>20-9-84</td>
</tr>
<tr>
<td>5</td>
<td>Madhavlal Shah High School</td>
<td>30</td>
<td>12</td>
<td>20-9-84</td>
</tr>
</tbody>
</table>

5.6 Significance of Reading Improvement Programmes in English Language

The earlier researches reveal the fact that reading can be improved. In a very important language like English, poor comprehension would lead to disastrous consequences. If understanding skill is to be improved fruitfully, one of
the tools is to prepare reading improvement programmes cautiously and to execute and implement vigourously these reading improvement programmes.

According to Fry Edward:

"One of the major methods of improving both speed and comprehension is to set the student to work through a series of timed reading passages followed by comprehension questions".1

According to Henry P. Smith and Emerald V. Dechant:

"The RIP includes differentiated instruction to meet the needs of each child, but it does not ignore the commonality of needs, interests and abilities among children. It looks upon reading as a perceptual process rather than as a subject. It is a tool which conceives reading for understanding and thinking, and aims to develop critical skills and flexibility in comprehension and rate in accordance with the pupils' abilities and purposes and difficulty levels of the material. It allows each pupil to progress at his own success rate to his maximum capacity. It seeks to develop reading maturity".2

For materialising the far-fetched dream of comprehension, the investigator took into account the components like understanding the meaning of words, phrases, questions and their answers.
5.7 **Highlights of Reading Improvement Programmes**

The investigator has taken only the literal level of comprehension into consideration. There can not be any progress at inferential or critical level at all because it is not expected when workable knowledge is the target. Word meaning, phrase meaning and sentence meaning plus contextual understanding have been enshrined on the preparation of programmes. Passive vocabulary items, basic function words as well as learnt structural patterns were wrapped in interest provoking content.

- The first programme was woven round a historical incident known to them. It was about Baber's sacrifice to save his son's life.

- The second programme had a geographical background of the life of Eskimos. It is also an interesting programme.

- The third one is based on the life of a great scientist, Jagdish Chandra Bose. It has encouraging and inspiring details.

- The fourth programme highlights an enlightening incident encircling Vivekanand and a Cobbler, an untouchable.
The fifth programme is a descriptive one. Pupils love journeys. It narrates the visit to a hill-station Darjeeling. The life of the people there, has been presented in the form of a word-picture. (See Appendix)

These five programmes were devised to be taught through the three strategies.

5.8 Preparation of Programmes Serving as Pre-tests and Post-tests

Pre-test was the measuring-rod with the help of which terminal behaviour which would be resultant as the effects of implementation of the Reading Improvement Programmes and visible in the post-test. Most of the patterns envisaged to be taught in this IX class have been included. Lexical items, content words were within the easy reach of pupils' power of comprehension.

1. The first passage is pertaining to the brave deed of a boy of Sri Lanka.

2. The second is also related to the famous incident of the gallant archer, William Tell.

3. The third passage is about the famous leader of India, Sardar Patel. It describes the event when he showed his courage and boldness.
4. The fourth one is entangled round the interest provoking story content. This story has a moral to be drawn by the pupils.

5. The fifth one was about the great King, Vikramaditya. His generosity has been illuminated in this passage. *(see Appendix A)*

5.9 Description of Tools for Measuring the Variables

The investigator thought it worthwhile to give the brief description of the tools used to measure the variables under study. The investigator selected the following variables:

1. Study Habits Inventory
2. Intelligence Quotients
3. Socio-Economic Status

(a) Study Habits:

This variable was studied in relation to the achievement in comprehension of the read material.

This inventory has been designed by Dr. B.V. Patel. It deals with seven major facets.

1. Environment of the home of the pupils and work planning. This area has seven statements.

2. Reading and note-taking is the second aspect. It comprises of nine statements.
3. The third aspect deals with subjects planning. There are five statements to be marked.

4. Concentration is the fourth major sector which consists of four statements.

5. Preparation for examination is the fifth area comprising of six statements.

6. Habits and attitudes occupy the sixth stage where eight statements measure their trend.

7. The atmosphere of the school is the seventh part which encompasses six statements.

In all, there is an intricate web woven out of 45 statements. This inventory is an artistic blend of mixed statements. It has a five point scale.

This inventory was used to locate the grade of the pupils in relation to their study habits. (See Appendix E2)

(b) Intelligence Quotients:

The second variable in the context of which comprehension achievement was viewed was Intelligence Quotient distribution. General Ability Test for standards VIII, IX and X developed by Dr. M.T. Patel was used by the investigator for this purpose.
This test is divided into two parts. Part one has 38 items whereas part two has also 38 items.

The first thirty items were to be solved on the basis of their common sense within 10 to 15 minutes. The other thirty eight items were to be solved of their own accord. The common observation power would give them an insight into these figures. Thirteen minutes were allotted to this section. A separate answer-sheet was used for this purpose. (see appendix)

(c) Socio-economic status:

This variable was taken into account to see whether there is any effect of socio-economic status on improving the comprehension of the read material through various strategies. This measuring-rod has been devised and modified by Dr. C.C. Pathak.

It has six sub-sections.
1. Educational Strata
2. (Monthly) Income
3. Material Facilities
4. Occupation
5. Housing
6. Other amenities.

This inventory has five point scale. The pupils were to round the number that would really be applicable to him/her. (see Appendix E3)
English being an unfamiliar language and having a lot of things different from our Indian languages, utmost care was taken in selecting the patterns as well as vocabulary items. Simple past tense forms, direct speech, complex construction with an adjective clause, simple future tense, negative forms, use of modal auxiliaries like 'may', irregular verbs of 'To be' and 'To have' in present and past tenses. Adverb clause of time, Noun clause, co-ordinating construction, passive construction, Adverb clause of cause, some phrasal verbs, prepositional phrases, infinitives and participles.

Basic requirements regarding the literal as well as inferential levels of comprehension were kept in the centre. Content words, action words and function words were also beyond their easy reach.

The material was evolved out of the life situations. Interest must be created and sustained for interest is the main spring of any language mastery. So interest provoking topics like:

1. The immortal incident of the sacrifice of Baber for his son Humayun.
2. Eskimos and their life.
3. Life of the great Indian scientist Shri Jagdish Chandra Bose.


5. An excursion to a hill station Darjeeling, and the experiences of the folk life there.

(b) Programmes for Testing the Entering Behaviour and Terminal Behaviour

Along with these programmes to be implemented through various strategies, five passages/programmes were designed which would serve as tests for entering behaviour.

These programmes also encompassed the same sentence patterns which were easily accessible to the students.

These programmes depicted interest sustaining topics like:

1. A brave school boy saving the train from a fatal accident.

2. A story of William Tell, the famous archer and his brave performance.

3. A life sketch of the national leader Sardar Vallabhbhai Patel.
4. An incident of the true servant of God.

5. A benevolent King Vikramaditya and his polite and generous behaviour towards the farmer.

The same five Reading Comprehension passages served as Post-tests, which tested the terminal behaviour of the students who were given various treatments through improvement strategies and the achievement of the controlled group having no other treatment but the traditional teaching work. Every passage had various objective type tests.

There were multiple choice tests, 'Fill in the gaps' test, short questions, Arrangement test and matching tests.

5.11 Specification of the Research Design

Every investigator must determine and plan out his course of action. A research design is to be forged out to tackle and encounter the research problem at hand more efficiently, accurately and vigorously. It helps the investigator in his endeavour to obtain answers to research questions more efficiently and to control variance which would pave the way towards accuracy. The experimental design or technique is the set up, procedure and conditions under which the experiment itself is carried out or conducted. Use of refined, well-planned techniques increased the accuracy of the results of experiments by utilising intelligently the principles of randomization, exercising sufficient
control over experimental conditions and extraneous factors, and subjecting the data to adequate statistical analysis in order to separate out the experimental error and the contribution of experimental conditions.¹

A variety of experimental designs have been encompassed by eminent scholars like M.R. Boga and C.V. Good, A.S. Barr and D. Scales. They have discussed thoroughly the designs such as one-Group method, Matched Group or Parallel Group method, Rotation Group method etc. A.L. Edwards and W.T. Federer discuss "Randomized Group design, Randomized Blocks design, Latin square design etc., for psychological research"².

The investigators are prone to use the most simple experimental design known as completely randomized groups design. This method has a salient characteristic of offering experimental treatments to the units entirely randomly and by chance the total number of subjects are divided at random into 't' groups of n subjects in each. These groups consist of total number of treatments i.e. include experimental groups as well as controlled group.

The above said design was followed with experimental groups as well as the controlled group.

Statistical Analysis

It is apparent that the data obtained through a simple two group design (experimental and controlled groups or any
two conditions for comparison of their effects) are analysed statistically by means of students' t test when the investigator intends to test the significance of the difference between the two means of either two independent or two related groups. Now-a-days, research methodology has taken rapid strides and the effects of more than two treatment levels or variables can be studied through more refined experimental designs and techniques in Statistics. This study can be done at a time so the techniques of CR and analysis of variance were selected by the investigator for the purpose of analysing the obtained data. The description of these two methods is as follows:

(i) Technique of t test:

To check the null hypotheses no. 1, 2, 3 and 22 as stated in chapter 1, investigator adopted the statistical methods of t test or CR for analysing and interpreting the data. To discover whether two groups differ sufficiently in mean performance to enable to say with confidence that there is a difference between the means of populations from which the samples were drawn, it needs to know the Standard Error of the difference between the two sample means.

The formula for the SE of the difference between uncorrelated or independent means is:

\[
\sigma_d = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}
\]

\(\sigma_{M_1}\) = the SE of the mean of the first sample
After computing $\sqrt{D}$ compute the CR or t test by dividing the difference between the sample means, its standard error i.e. $CR = \frac{D}{\sigma}$, the obtained 't' value is computed with table 'C' as chosen level of confidence.

(ii) Technique of Analysis of Variance

R.A. Fisher was the pioneer of the technique of analysis of variance or the F test. It is an arithmetical process for analysing or partitioning the total sum of squares (variance) into components associated with recognised sources of variation. After breaking up the total variance into components, each component is compared with residual errors or within-group variance, i.e. tested by F-test.

$$F = \frac{\text{Mean sum of squares for component or between group variance}}{\text{Mean sum of squares for error or within group variance}}$$

$$= \frac{MS_B}{MS_W}$$

The obtained F value is compared with the tabulated F-value as chosen level of confidence for df = (t-1) for between groups and (n-1) for within group, where t is the number of treatments or groups and n is the number of subjects in each group. F-test is used to test the overall significance of
difference of means between groups usually for two groups or more than two groups. If $P$ is found significant it means that there is overall significant difference between the treatments.

**Computations**

For each subject in the investigation a measure $X$ is known as a dependent variable. The independent variable consists of the different experimental treatments ( ). The data obtained in terms of $X$ are subjected to statistical techniques of analysis of variance. A summary table of the results of analysis of variance can be indicated as follows:

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>df</th>
<th>SS-Sum of Squares</th>
<th>Mean SS</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups (Treatments)</td>
<td>$t-1$</td>
<td>$SS_B$</td>
<td>$NS_B$</td>
<td>$NS_B$</td>
</tr>
<tr>
<td>Within groups (Error)</td>
<td>$N-1$</td>
<td>$SS_N$</td>
<td>$NS_W$</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$N-1$</td>
<td>$SS_I$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specifications of Computations for Analysis of Variance**

1. Summate all scores under each sub-group as well as main group i.e. find out the values of $\bar{x}_1$, $\bar{x}_2$, $\bar{x}$. 
2. Square each and summate all these i.e. find out $\sum X^2$.
3. Calculate the correction term: $C_0^2 = \frac{\sum X^2}{N}$
4. Compute the different sums of squares as below:

(a) $SS_{Tot} = \sum X^2 - Cor.$
(b) $SS_{N,S} = \left(\frac{\sum X_1^2}{n_B}\right)^2 = \left(\frac{\sum X^2}{n_0}\right)^2 - Cor.$
(c) $SS_W = SS_T - SS_{N,S}$

Specification of the Groups

It becomes inevitable for the investigator to specifically mention the groups which are encompassed in the study. In the experimental design in this study, there were two types of treatments using the Reading Improvement Programmes, three experimental groups being imparted instruction through Request procedure, REAP technique and the Guided Reading Procedure respectively and the fourth group getting the conventional type of treatment. The controlled group was conspicuous by its absence in the present experimental design. The group that received instruction through the traditional method of teaching was considered to be the control group. In this sense, that the control group is used. The groups 1, 2 and 3 which received treatments of various strategies like the Request Procedure, the REAP technique, and the Guided Reading Procedure were included in the "Experimental Groups".
While giving the treatment, a uniform strategy was maintained for that particular experimental group. This was applicable to all the three groups.

**Requirements for Experimentation**

It was crucial to fulfil the requirements. The subjects of the groups had to adhere to those requirements. They are as follows:

1. Every subject should be of the IX class.
2. The subject took the study habits inventory, Intelligence Quotients test and Socio-economic status inquiry etc.
3. The subject took the entering behaviour test.
4. The subject of the experimental groups was not taught in the class of the content which was included in the treatments.

The experiment was conducted as described in the following passage.

**Implementation of the Experiment**

Before the investigator dived deeply into the process, the prior permission of the heads of the institutions concerned, as well as the English teachers whose periods were to be utilized was sought. In the beginning of the first term, the data regarding the number of the pupils, their
achievement in the VIII standards were noted. On the basis of the marks achieved in the annual examination in English, the pupils were selected. There was no choice regarding the strategy allotment to the experimental groups.

The investigator made a schedule according to which he himself visited the school with the relevant material and full co-operation of the heads of the institutions and the English teachers was resorted to. The control group had no treatment except the conventional teaching of the textbook, whereas the investigator himself taught the Reading Improvement programmes strictly adhering to the implementation of the strategy.

In India, English is taught as a foreign language and especially in Gujarat much heed is never paid to English. One feels terror for their errors and hence every strategy has a social transformer. The strategy in its natural setting won't be fitting in in the other kind of social set up. So the strategies were slightly modified in light of the social structure.

Schedule for the Experiment

Schedule for the execution of the experiments was prepared in consultation with the experienced teachers of English of those high schools. English has found its place...