CHAPTER 4

RESEARCH PLANNING AND PROCEDURE

4.1 Introduction

4.2 Population

4.3 Selection of the sample

4.4 Tool Construction

4.5 Data analysis
4.1 Introduction:

This chapter discusses the detailed information regarding population, drawing of sample and sampling technique and data analysis. Analysis of the scores also reflected the effects of independent variable and their interaction effects on numerical ability which were useful in the establishment of norms as well as guide us in future for the development of numerical ability among students. Norms are tables of information necessary for the interpretation of the test scores and are obtained by giving the particular test to a large and representative sample of the population. Sampling of the population is done with great care and as it is distributed over a large population the condition under which the test is administered is rigidly followed, so norms furnish a reliable and useful basis for information. This chapter throws light on it.

4.2 Population:

In any research the utmost important factor is the universal set of subjects to whom the results are to be applied call it as population of the study.

A population is any group of individuals that have one or many characteristics in common that are of interest to the researcher.³³

Looking to the present scenario, and to meet the needs of today, researcher decided to standardize the constructed numerical ability test (NAT) for students studying in English medium and so target population for this study will be students studying in std. VIII & std. IX of English
Medium schools following Gujarat state board textbooks, situated within Gujarat State.

4.3 Selection of Sample:

It is impossible to cover the entire population under study by the investigator. And so to save time, energy and economy representative of the population has to be selected on which research can be carried out and acquired results can be entered to the population.

As stated by Sirois, Schmutte & Sprinthall¹ “A sample is a smaller number of observations taken from the total number making up a given population.”

Selection of a sample is a very important step in conducting a research study. To ensure that samples represent the population, individuals have to be selected randomly although various sampling procedures are being used. According to the nature of the study various sampling methods are categorized as (1) Probability sampling (2) Non-Probability sampling.

In the present study, investigator has used probability sampling method and technique used for the sampling is stratified random cluster sampling technique.

As the objective of the final run of administration of numerical ability test was to establish the norms of the test, targeted population i.e. Gujarat State had to be considered and representative sample had to be
drawn. The investigator studied Gujarat map. Gujarat state was divided among four zones:

(1) North Zone
(2) Middle Zone
(3) South Zone
(4) Kutch - Saurastra Zone

From each zone districts were selected as per the size of the zone. Out of the total of 26 districts of Gujarat state 13 were selected randomly. Each selected district was further classified into urban and rural areas. Then one school each from these areas was selected at random. Manytimes random selection was not possible in rural areas as number of English medium schools is very limited. List of schools selected from various districts of Gujarat is shown in appendix: 1.

Now the test was administered to one whole division of std.VIII and std.IX. Thus, stratified random cluster sample formed the norm group. Norm group had a sample of 3287 students from urban and rural area of both std.VIII and std.IX. Table 4.1 shows the sample for the final run.
Table: 4.1
Sample for final run

<table>
<thead>
<tr>
<th>Std.</th>
<th>Area</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIII</td>
<td>Urban</td>
<td>655</td>
<td>453</td>
<td>1108</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>343</td>
<td>235</td>
<td>578</td>
</tr>
<tr>
<td>IX</td>
<td>Urban</td>
<td>514</td>
<td>388</td>
<td>902</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>389</td>
<td>310</td>
<td>699</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1901</td>
<td>1386</td>
<td>3287</td>
</tr>
</tbody>
</table>

4.4 Tool Construction:

The first objective of the study was to construct numerical ability test. It was a challenging task. After reviewing various type of literature, components contributing to numerical ability were decided. They are numerical facility, arithmetic concepts, relative magnitude, number series and number matrices and arithmetic reasoning. After getting components reviewed by few experts, items were constructed for each component and instructions were drafted. The experts reviewed constructed items and keeping their suggestions in mind necessary changes were made and preliminary draft of the test was prepared.

Now the test was administered on a small sample and from the observations necessary modifications were done. Test was again administered for the first try out of pilot study. From the experience of first tryout very easy and very difficult items were removed and average
time for computing each item was calculated. It was felt that average time of 1 minute for each item was proper. Now the filtered version of the test was ready for the second tryout. Objective behind second tryout was to do item analysis. Test was administered on a bigger sample and difficulty value and discriminating index was calculated for each item. On the basis of difficulty value and discriminating index, eight items for each component were selected and arranged as per their difficulty value. So the final test was an assembly of five components having altogether 40 items. These 40 items were selected on the basis of their difficulty and discriminating index. The test was printed in the form of booklet. Separate answer sheet was provided along with the test booklet to note the answers. Necessary instructions were printed on one side of answer sheet.

Detailed information regarding to the construction, procedure, sample and standardization of the test is mentioned in chapter-5.

4.5 Data Analysis:

For the standardization of the test two big task had to be computed. One was item analysis and the other was establishing reliability and validity of the test. After the first tryout, the filtered version of the test was administered on a larger sample for performing item analysis. After the second tryout, all the answer sheets were scored and were arranged in the ascending order of the total marks obtained. Using Kelley’s method lower group and
upper group were formed and difficulty value and discriminating index were computed for each item. Selection of items for the final version of the test was done on the basis of difficulty value and discriminating index.

Reliability of the test was established by using test-retest method, split-half method and KR$_{20}$ formula. Validity of the test was found by correlating the scores of numerical ability test with K.G.Desai's verbal-non verbal intelligence test scores and correlating the scores of numerical ability test with student's mathematics achievement scores. Coefficient of correlation was computed with the help of Karl Pearson's raw score correlation formula. Thus, reliability and validity of the test were computed.

Further, administration of test provides us raw scores. This test scores can be made more readily interpretable by converting it into some type of derived score that indicates student's relative position in a reference group. This can be done by the means of norm table.

Norms compare an individual's score to those of other people in a specific norm group, they indicate the testee's relative standing or ranking within the norm group. So norms describe the performance of testee in a reference group. It also determines what a representative group of persons actually do on the test.

There are various type of norms. E.g.: Age norms, grade norms, gender norms, area norms, occupational norms etc.
These norms can be computed by various statistical techniques depending upon the type of test. They are percentile, percentile rank, standard score etc.

Among all percentile rank (PR) is the most widely used method and its interpretation is also straightforward. PR shows the relative standing of an individual in the group. Along with PR, another method of indicating a student’s relative position in a group is by showing how far the raw score is above or below average. This is done by representing norms in the form of standard scores. Standard score shows the deviation of a raw score from the mean in standard deviation unit. There are various ways to convert raw scores into standard scores like z-score, T-score, stanine scale.

As z-score can yield negative as well as decimal value, it is a recommended procedure to convert raw score to a scale having a mean of 50 and SD of 10, which gives us T-score. T-scores are rounded whole numbers.

There were two objectives for administering the test on norm group:

(1) To study numerical ability of students in terms of their school area, their gender, their std. and interaction between them.

(2) To establish norms for numerical ability after observing the effects of independent variables on numerical ability.
So the test was administered on the sample selected from the Gujarat state as shown in table: 4.1

To establish the norms, it is very important to determine whether there are any significant differences between the means of these samples? A composite procedure for testing simultaneously the difference between several means is Analysis of Variance (ANOVA). It helps us to tell whether any of the differences between means of the given samples are significant or not. If we get significant difference we should establish separate norms for those groups. So ANOVA was computed and effect of independent variable was observed on numerical ability. Norm table was prepared as per these observed effects. So a table showing PR values and T-scores was prepared as per the required group.
CHAPTER REFERENCE
