CHAPTER 3
RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

“Plans are only good intentions unless they immediately degenerate into hard work” - Peter F. Drucker.¹

This chapter presents in detail the plan and procedure of the present study. Experimental research design is founded on the assumptions that the world works according to casual laws. The goal of experimental research is to establish this cause-and-effect law by isolating causal variables. Some (if not all) important questions are about what causes what. Experimental research designs are the tools used for these questions. According to John Davis, “The goal of experimental research method is to establish cause and effect relationship between variables we hypothesize, that the Independent Variables cause the change in the Dependent Variables. The purpose, therefore, of experimental designs is to eliminate alternative hypotheses. If we can successfully eliminate all alternative hypotheses, we can argue – by a process of elimination – that the Independent Variable is the cause”.²

If any experiment is well planned, below mentioned benefits can be achieved:

1. Research work becomes easy and fast
2. Proper directives are obtained.
3. During experiments, one can perceive any problem which can arises.
4. Wastage of time, memory and energy can be curtailed.

The research work is an organized endeavour. Like any other organized work research requires proper planning. To decide well in advance is planning. If research is not properly planned then the solution to any problem will lead in wrong direction.
The primary purpose of the present study is to see the effect of Vedic Mathematical Techniques on Mathematical skills at class VII. For this, it was necessary to construct a suitable research design for the testing of the hypotheses. This chapter discusses the methodology and procedure adopted and the experimental design followed for the verification of the hypotheses formulated to achieve the objective of the present study.

3.1 Outline of the study

Out-line of the present study was as follows:

1. Origin of Problem
2. Population of the Study
3. Sample Selection
4. Selection of Experimental Design
5. Content Selection
6. Content Analysis of Selected Chapters
7. Development of the Vedic Mathematical Techniques Tool
8. Implementation of the Experiment
9. Evaluation of the developed VMT Tool
10. Data Collection and Analysis

3.2 Origin of the Study

Before taking up any kind of research, the selection of the study subject becomes an essential element for a researcher. The selection of the problem is the first step in research. The term “problem” means a question or an issue to be examined. Vision of selection is totally based on the researcher’s preference. The root cause of the problem originated from the academic experience of the researcher; especially
classroom lectures, exchange of ideas with colleagues as well as students; which provoked the researcher for the topic selection. The researcher also aims to bring a revolution in the traditional teaching more interactive.

Based on the researcher’s personal experience, as a maths teacher for three years in primary school of Panchmahal (Gujarat) as well as Dahod (Gujarat) districts, the researcher found that the traditional way of teaching was insipid and non-attractive. The students of standard VII, GCERT find it difficult and uninteresting to understand and learn mathematics, especially chapters related to arithmetic and algebra. This has been discussed earlier in chapter two. Hence the researcher took up the challenging task of making the subject more attractive and lucrative in his study. After thorough analysis the research decided on students’ achievement.

### 3.3 Population

“Population means Universe”.

“Population is the aggregate of all units possessing certain specified characteristics on which the sample seeks to draw inferences”.

The population is the group of interest to the researcher, the group to which she or he would like the results of the study to be generalizable. Being an experimental study by nature, Students of std. VII studying in Gujarati medium schools of Visnagar Town of Mehsana district of Gujarat state were included in the population. List of schools of Visnagar Town is attached in Appendix - A.

### 3.4 Sampling

“The representative proportion of the population is called a sample.”

A sample is a small proportion of a population selected for observation and analysis. By observing the characteristics of the sample, one can make certain inferences about the characteristics of the population from which it is drawn.
The present study was experimental in nature. Researcher purposively selected Shrimati L. R. H. Patel (Godwala) Primary School, Visnagar for experimental group and Shri Swaminarayan Gurukul Primary School, Visnagar for control group.

In the present study, from the available different sampling methods, the researcher has selected the following sampling methods:

1. Purposive Sampling
2. Random Sampling

From the above two methods of sample selection, samples were selected easily from the population.

In the present study, from all the Gujarati medium Upper primary schools of Visnagar city two gujarati medium schools were selected purposively.

The schools selected were:

1. Smt. L. R. H. Patel (Godwala) Primary School, Visnagar
2. Shri Swaminarayan Gurukul Primary School, Visnagar

For carrying out the study the students of above two schools were selected as the sample of the study. Total number of the students was 98 of Standard VII. In this study for carrying out experiment Shrimati L. R. H. Patel (Godwala) Primary School, Visnagar was considered as experimental group and Shri Swaminarayan Gurukul Primary School, Visnagar was considered as control group. The experiment was decided to conduct on the students of std VII studying in Visnagar Town in Gujarati medium schools syllabus prescribed by GS&HSEB, Gandhinagar of Gujarat state.

First of all the students were given 6th Standard Mathematics subject final exam marks. To know the significance differences among groups, mean and t-test was counted to equalize the two groups. Then draw was conducted to select the school and
method or techniques to be taught. The detail of the sample of the present study is given in the table 3.1.

### Table 3.1
Sample profile of the study

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sex</th>
<th>Habitat</th>
<th>Achievement in Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vedic Mathematical Techniques</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>17</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>16</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>18</td>
<td>53</td>
</tr>
<tr>
<td>Conventional Mathematical Techniques</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>13</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>12</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>21</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>98</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From above table it is seen that the investigator had selected 53 students from Smt. L. R. H. Patel (Godwala) Primary School and was described as Experimental Group – I (Vedic Mathematical Techniques). There was 36 boys and 17 girls, 37 urban and 16 rural students and 35 above average students and 18 below average students in this group.

From above table it is seen that the investigator had selected 45 students from Shri Swaminarayan Gurukul Primary School and was described at Control Group – 2 (Conventional Mathematical Techniques). There were 32 boys and 13 girls, 33 urban and 12 rural students and 24 above average students and 21 below average students in this group.

### 3.5 Research Design

Research design is an important part of research. The choice of research design depends upon purpose of the study, the resources available and the kind of data that the problem entails. Experimental research design is preferred when the researcher wants to observe the effects of independent variables on the dependent
variable within certain controlled situations. In the present study the researcher has used experimental research method.

An experimental technique provides much control and therefore, establishes a systematic and logical association between manipulated factors and observed effects. The researcher defines a problem and proposes a tentative answer or hypotheses. The researcher tests the hypotheses and accepts or rejects it in the light of the controlled variable relationship that he has observed.

3.6 Selection of Experimental Design

“In a very real sense, every piece of research is unique and calls for a unique methodology. We, as the researcher, have to develop it”.vi

There are two main types of research methodology: (1) Quantitative methodology and (2) Qualitative methodology. Quantitative methodology is the type by which we test the significance of our hypotheses, in other words we answer the words: How much? Is there a relationship? Quantitative methods tend to be systematic and use numbers.

“A blueprint of the procedure that enables the research to test his hypotheses by reaching valid conclusions about relationships between independent and dependent variables is known as experimental design”.vii

(Post-test Non Equivalent Quasi Experimental Group Design)

Quasi – Experimental designs are used in experimental situations in which it is not possible for the experimenter to assign subjects randomly to groups or exercise full control over the scheduling of experimental conditions.viii This design is often used where experimental and control groups are naturally assembled groups as intact classes which may be similar.ix Analysis of Co-variance is used to compensate for the lack of equivalency between the groups.
The researcher discussed with different subject experts and with the research experts about the design of the study. The list of the subject experts and research experts is shown in Appendix C. Then the researcher decided post test non equivalent control group design for the present study. One experimental and one control group only post test design can be diagrammed as under:

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pre-Test</th>
<th>Independent Variables (Treatment)</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group - E1</td>
<td>-----</td>
<td>X1 Vedic Mathematical Techniques</td>
<td>T2E1</td>
</tr>
<tr>
<td>Control Group – C1</td>
<td>-----</td>
<td>X2 Conventional Mathematical Techniques</td>
<td>T2C1</td>
</tr>
</tbody>
</table>

Where,

E1 Experimental Group - 1
C1 Conventional Group - 1
X1 Vedic Mathematical Techniques
X2 Conventional Mathematical Techniques
T2E1 Post-Test given to Vedic Mathematical Techniques Group
T2C1 Post-Test given to Conventional Mathematical Techniques Group

Table 3.2 shows that there were two groups in the present experimental study. E1 was experimental group and C1 was control group. Dependent variable achievement on Maths was not measured before treatment. The treatment was given to experimental group and control group. At the end of the treatment same post test was administered to all the two groups and the difference between all the two groups were measured to know the effect of treatment.

Six units were selected for the present study and each unit was taught for four days. The researcher himself gave treatment to all the two groups. In the present study experimental group was taught by Vedic Mathematical Techniques and control group
was taught by Conventional Mathematical Techniques. After the treatment, common post test was given to all the two groups and their effect was measured.

### 3.7 Ingredients of Experimental Research

In the experimental research, the researcher has some degree of control over the variables involved and the conditions under which the variables are observed. The researcher deliberately manipulates certain stimuli, treatments or environmental conditions and observes how the condition or behaviour of the subject is affected or changed. The researcher must be aware of these factors that could influence the outcome and remove or control them to establish a logical association between manipulated factors and observed effects.

#### 3.7.1 Manipulation

Manipulation means the researcher decides what forms or values the independent variables (or cause) will take and which group will take which form. In order to manipulate a variable, the researcher has to decide who is going to be what or who is going to get what.

In the present study techniques and method of teaching is the independent variable manipulated by the researcher.

#### 3.7.2 Control

Control is the essential ingredient of experimental research. The main aim of the control is to remove the influence of any variable (other than the independent variable) that might affect performance on the dependent variable. The researcher wants the groups to be as equal as possible.

In the present study the researcher has controlled variables like standard, subject, content and medium directly and students pre achievement on Mathematics statistically other than the variables which has effect on dependent variables.
3.8 Threats to Experimental Validity

In experimental design, any uncontrolled extraneous variables affecting performance on the dependent variable are threats to the validity of an experiment. The experimental is valid only when the results are only due to the manipulated independent variable and they are generalizable to situations outside of the experimental setting.

Campbell and Stanley have identified two major threats to the validity of experimental design:

1. Internal Validity and
2. External Validity

3.8.1 Internal Validity

Internal validity refers to the condition that observed differences on the dependent variable are a direct result of manipulation of the independent variable, not some other variable. The extent to which this aim is attained is a measure of internal validity of experimental design.

In the present study the researcher had tried to control the extraneous variables which might affect the internal validity of the experiment.

3.8.1.1 History

History refers to the occurrence of any event which is not part of the experimental treatment but which may affect performance on the dependent variable.

In the present study the researcher had full control over the extraneous events and current events created equal effects to all the groups during the experiments.
3.8.1.2 Maturation

Maturation refers to physical or mental changes that may occur within the subjects over a period of time. These changes may affect the subjects’ performance on the measure of the dependent variable.

In the present study the researcher has selected STD VII students similar in age for the experiment and so maturation did not have any effect on the dependent variable.

3.8.1.3 Testing

Testing, also referred to as pre test sensitization, refers to improved scores on a post test resulting from subjects having taken a pre test.

In the present study pre test is not taken as analysis of a number of published research reports has indicated that testing can be a problem in any study.

3.8.1.4 Instrumentation

Instrumentation refers to unreliability, lack of consistency, in measuring instruments which may result in any invalid assessment of performance. Different measuring instruments, Scores, rates, interviewers or the observers may account for the observed differences in the scores of the dependent variable.

In the present study format of the post test was kept uniformly and was taken simultaneously on the same day.

3.8.1.5 Statistical Regression

Statistical regression occurs when subjects are selected on the basis of their extreme scores may cause statistical regression effect. The tendency is for scores to regress or move toward the mean of expected score.

In the present study the researcher has tried to control this variable.
3.8.1.6 Differential Selection

Differential selection is represented by the non-equivalence of experimental and control groups, and its most effective determinant is the random assignment of subjects to treatments.

In the present study the researcher selected two groups purposively as two intact classes. A STD VII final exam Mathematics subject marks were taken and all the groups were equalized using statistical technique.

3.8.1.7 Experimental Mortality

The differential loss of subjects from the comparison groups may affect the findings of the study.

In the present study there was no drop out. So this variable was controlled.

3.8.1.8 Selection Maturation Interaction

This extraneous variable is similar to differential selection except that maturation is the specific confounding variable.

In the present study all subjects are of similar age of the same city. The researcher had done draw to decide which group will receive which treatment.

3.8.1.9 The John Henry Effect

When the subjects of the experimental group and the control group feel that they are in competition with each other. Each group try to perform better than the other group.

In the present study the subjects of the two groups were not informed about other groups and care was taken to control this effect.

3.8.1.10 Experimental Treatment Diffusion

Experimental treatment diffusion is likely to occur when the experimental and control subjects are in close proximity to each other.
The researcher has taken care to control this variable. The researcher has selected an appropriate experimental design that controls these factors. The researcher has kept good experimental control with a high degree of confidence to the experimental treatment.

3.8.2 External Validity

External validity refers to the condition that results are generalizable or applicable, to groups and environments outside of the experimental setting. The following are the threats to external validity of the experiment.\textsuperscript{xii}

3.8.2.1 Pre-test - Sensitization

The use of a pre-test at the beginning of a study may sensitize individuals by making them more aware of concealed purpose of the researcher and may serve as a stimulus to change.

In the present study no pre-test was taken so this external validity is controlled.

3.8.2.2 Multiple – Treatment Interference

Multiple – Treatment interference can occur when the same subjects receive more than one treatment in succession.

The researcher had given one treatment to each group. Two different methods were implemented for two different groups.

3.8.2.3 Selection Treatment Interaction

Researchers are rarely, if ever able to randomly select sample from the wide population of interest or randomly assign to groups; consequently, generalization from samples to populations is hazardous. The results ultimately prove misleading.

The researcher has chosen an experimental design in which only one treatment was assigned to each subjects.
3.8.2.4 Reactive Arrangements

Sometimes the subjects become alert for being experimented and the researcher imposes careful controls to control extraneous variables which may introduce an artificial atmosphere that is not at all like life like situation about which generalization are desired.

In the present study the researcher tried to make the atmosphere life like by not informing the subjects about the experiment.

3.8.2.5 Hawthorne Effect

When the subjects of the experiment become aware that they are participating in the experiment and the subjects’ attention may cause a change in their behaviour. So the findings may not generalize to a situation in which similar personnel are not present.

During the experiment the subjects were not informed about the experiment and proper care was taken that subjects behaviour may not affected by the treatment.

3.9 Programme Development

The present study being experimental in nature, it is very worth noting to develop teaching programme. The researcher has developed programme of Mathematics teaching of Vedic Techniques and Conventional Techniques. First the researcher had reviewed the past studies, reference books and text books of Mathematics. The researcher discussed about the content to the subject experts and research experts about the selection of units. As per the discussion with experts the researcher decided to select std. VII text book of Mathematics of Gujarati medium school of Gujarat state. Then the researcher selected six teaching units for development of programme. Once again the researcher had also discussed about the design of the programme with experts. Two different teaching programmes were
developed by the researchers which are teaching through Vedic Techniques and teaching through Conventional Techniques. The design of the programme can be shown in Appendix B. The detail development of the programme is discussed as under.

3.9.1 Preparation of Design of Vedic Mathematical Techniques

The researcher has selected six teaching units for teaching and each unit was taught for four days. On the very four day, the researcher gave revision of Mathematics simple addition, subtraction, multiplication and division. The same Primary Concept of Vedic Mathematics with reference to addition and detriment with example.

1. Primary Concept of Vedic Mathematics with primary introduction with example.
2. Primary Concept of Vedic Mathematics with primary introduction of addition and subtraction with example.
3. Primary Concept of Vedic Mathematics with reference to multiplication with example.
4. Primary Concept of Vedic Mathematics with reference to division with example.
5. Calculation of Vedic Mathematics with reference to mixed effect of addition, subtraction, multiplication and division with example.
6. Calculation of Simple Interest with example by using Vedic Mathematics, reference too.
7. Calculation of Vedic Mathematics with reference to square and square root with example.
8. Calculation of Vedic Mathematics with reference to Volume with example.
9. Calculation of Vedic Mathematics with reference to Polynomials with example.

10. Primary Concept of Vedic Mathematics with reference to Equation with example.

11. The following criteria were kept in mind while designing the programme.

Topics of teaching units were selected from Mathematics text book of std. VII from Gujarat state text book board, Gandhinagar. Weight age given to the each topic is given as Appendix D.

3.9.2 Preparation of Design of Conventional Mathematical Techniques

Here the tern Conventional is considered as Traditional Techniques. In Conventional Techniques the teacher is the dominating personality in the classroom. There is little chance for teacher student interaction and student-student interaction. In this techniques extensive use of the chalk and talk method was used. The investigator had adopted the following steps of the classroom procedure according to traditional education system of teaching mathematics by the steps of introduction, explanation, drill work, evaluation and assignment. Please refer Appendix-G (Schedule of the Experiment).

The researcher has selected six teaching units for teaching and each unit was taught for four days. On the very first day, the researcher gave traditional teaching technique of Mathematics simple addition. On the second day, the researcher gave traditional teaching technique of mathematics simple subtraction. On the third day the researcher traditional teaching technique of Mathematics simple multiplication and on the fourth day the researcher gave traditional teaching technique of mathematics simple division. The following criteria were kept in mind while designing the programme.
1. Topics of teaching units were selected from Mathematics text book of std.VII from Gujarat state text book board, Gandhinagar.

2. The duration of teaching programme of each unit was kept four days.

3. The teaching units were kept the same in all the two groups.

4. The post test was prepared by the investigator and was kept same to all the groups but the instructions are different. (Appendix E)

3.10 Experts Views on the Design of the Programme

The researcher discussed the design of the programme with Mathematics experts as well as research experts in detail. They all appreciated the design of the programme and made a few suggestions as well. There was a great amount of diversity in their views and suggestions, keeping in mind suggestions received from subject experts and research experts, corrections were made in the design of the programme as well as in the post test also. The majority of suggestions were received and corrected in post test. The list of experts’ is given in the Appendix C. Suggestions and changes according to the direction of experts made by the researcher are as under:

- Unnecessary Questions have to be removed.

- Define the original source from where formulas were adopted and it should be explained with proper illustration in details.

- Allocation of Practical work with reference, to content of the chapters in its suitability and allotment with adequate time management according to the interest of the students.

- Instruction of the Both Groups with reference to Achievement test of control group and experimental group should be mentioned and information for each item of test should be indicated specially.
➢ Time of test should be clear for attempting questions.

3.11 Tools

In the present research, researcher used total two research tools to collect data from sample which are as under:

1. Pre – achievement test
2. Mathematics Achievement test (Post Test) measured Speed and Accuracy.
3. Mathematical Interest Inventory measured Interest.
4. Assignment Test measured Accuracy.

Out of two tools, first tool was Pre – achievement test of std. VI, second tool of Mathematics Achievement test was prepared by the researcher himself and third tool was used to measure the interest of students by using Mathematical Interest Inventory prepared by the researcher. Fourth tool was used to measure the accuracy. The details of the tools are given as under:

3.11.1 Mathematics Achievement Test – Post Test

The post-test was prepared by the researcher himself keeping in mind the four basic objectives, knowledge, understanding, application and skills. The weigh age of the post test was kept 60 marks. In the present study the researcher has prepared post test to examine the effect of Vedic Mathematical Techniques and Conventional method.

The details of the development of the achievement in Mathematics are presented as under. The researcher had followed the following process:

1. Discussing with the subject experts.
2. Deciding the objectives of the test.
3. Reviewing the materials and getting help and suggestions from subject experts.
4. Preparing blue print.
Writing of the test items.

Expert opinion on the test

Final form of the test

3.11.1.1 Discussing with subject Experts

Before to construct the Mathematics achievement test researcher discussed with the subject experts and got basic information about the construction of the test.

3.11.1.2 Deciding the objectives of the test

In the present study, the objective of development of achievement test was to know the Mathematics achievement after teaching of Vedic mathematical techniques and conventional method.

3.11.1.3 Reviewing the materials

The researcher had gone through the different materials of Mathematics teaching. Researcher had discussed with subject experts about the tests and finally the test was prepared for four objectives of Mathematics teaching. In the test researcher had decided to include objective questions, understanding questions, application type of questions and skill based questions. The blue print is presented in Appendix – D.

3.11.1.4 Writing the test

The following points were kept in mind for writing the test.

1. Objectives of the questions
2. Weigh age for the content
3. Formation of item under each objectives
4. Difficulty value and discrimination value of the item

3.11.1.5 Experts Opinions on the Test

The post test was sent to the experts for getting their suggestions with the design of the programme.
3.11.1.6 Final Form of the Test

After getting suggestions on Mathematics Achievement test experts, final form of test was written. Final form was consisting of the introductory page and test item pages. A copy of final Post Test is presented in Appendix E.

The test was prepared based on 4 skills of Mathematics Teaching. Total 5 items in knowledge, 8 items in understanding, 10 items in application and 2 items in skill were included in the post – test.

<table>
<thead>
<tr>
<th>NO.</th>
<th>TYPE OF QUESTION</th>
<th>NO. OF QUESTIONS</th>
<th>MARKS ALLOTTED</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge</td>
<td>05</td>
<td>05</td>
<td>8.33%</td>
</tr>
<tr>
<td>2</td>
<td>Understanding</td>
<td>08</td>
<td>20</td>
<td>33.33%</td>
</tr>
<tr>
<td>3</td>
<td>Application</td>
<td>10</td>
<td>27</td>
<td>45%</td>
</tr>
<tr>
<td>4</td>
<td>Skill</td>
<td>02</td>
<td>08</td>
<td>13.34%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>25</td>
<td>60</td>
<td>100%</td>
</tr>
</tbody>
</table>

The items form was multiple type, very short answer and short answer. The time limit for the test was 1:30 hours.

3.11.2 Mathematics Interest Inventory

In the Mathematics Interest Inventory was prepared by the researcher with five point rating scale to measure the interest of the students learning by the Vedic Mathematical Techniques. Total 20 items were selected according to the suggestion and necessary guideline of experts. Please refer Appendix-F. (Mathematics Interest Inventory).

3.11.3 6th std. final exam marks of Mathematics

Researcher required previous examination marls of learners of all the groups. So researcher first approached the principal of Smt. L. R. H. Patel Primary Vidyalaya and Shri Swaminarayan Gurukul Primary School and collected the marks of previous annual examination held in April 2012.
3.12 Pilot Teaching

The researcher made the contact with the principal of N. V. Patel Kanya Vidyalaya and G. D. High School, Visnagar and finalized the schedule for pilot testing. The researcher also made contact with students and subject teachers. The researcher made a draw to finalize the teaching method and school. The pilot teaching was continued for 10 days from 15-06-2012 to 26-06-2012.

Table 3.4
Pilot Teaching Schedule of the Programme

<table>
<thead>
<tr>
<th>Days</th>
<th>Date</th>
<th>Day</th>
<th>Topic</th>
<th>Experi. Group Time</th>
<th>Conv. Group Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15/6/12</td>
<td>Friday</td>
<td>Basic Maths (Multiplication)</td>
<td>8-10 to 8-50</td>
<td>9-40 to 10-20</td>
</tr>
<tr>
<td>2</td>
<td>16/6/12</td>
<td>Saturday</td>
<td>Basic Maths (Division)</td>
<td>9-40 to 10-20</td>
<td>8-10 to 8-50</td>
</tr>
<tr>
<td>3</td>
<td>18/6/12</td>
<td>Monday</td>
<td>Square based Examples</td>
<td>8-10 to 8-50</td>
<td>9-40 to 10-20</td>
</tr>
<tr>
<td>4</td>
<td>19/6/12</td>
<td>Tuesday</td>
<td>Square root based Examples</td>
<td>9-40 to 10-20</td>
<td>8-10 to 8-50</td>
</tr>
<tr>
<td>5</td>
<td>20/6/12</td>
<td>Wednesday</td>
<td>Polynomials (Addition-Subtraction)</td>
<td>8-10 to 8-50</td>
<td>9-40 to 10-20</td>
</tr>
<tr>
<td>6</td>
<td>21/6/12</td>
<td>Thursday</td>
<td>Polynomials (Multiplication)</td>
<td>9-40 to 10-20</td>
<td>8-10 to 8-50</td>
</tr>
<tr>
<td>7</td>
<td>22/6/12</td>
<td>Friday</td>
<td>Formula based Examples of Polynomials</td>
<td>8-10 to 8-50</td>
<td>9-40 to 10-20</td>
</tr>
<tr>
<td>8</td>
<td>23/6/12</td>
<td>Saturday</td>
<td>Applied Based Examples of Polynomials</td>
<td>9-40 to 10-20</td>
<td>8-10 to 8-50</td>
</tr>
<tr>
<td>9</td>
<td>24/6/12</td>
<td>Monday</td>
<td>Simple Interest Examples (Month, Year)</td>
<td>8-10 to 8-50</td>
<td>9-40 to 10-20</td>
</tr>
<tr>
<td>10</td>
<td>26/6/12</td>
<td>Tuesday</td>
<td>Simple Interest Examples (Days)</td>
<td>9-40 to 10-20</td>
<td>8-10 to 8-50</td>
</tr>
</tbody>
</table>

3.13 Implementation of the programme

For implementation of the programme, the researcher made contacts with principals of Smt. L. R. H. Patel primary School and Shri Swaminarayan Gurukul Primary School, Visnagar. A good rapport was established with the subject teachers and students to create proper environment for the experiment in the school. The researcher made draw for deciding school and teaching programme. Then it was finalized that

Group 1:Smt. L. R. H. Patel primary School: Vedic Mathematical Techniques

Group 2:Shri Swaminarayan Gurukul Primary School: Conventional Mathematical Techniques
The time schedule for the experiment is given in Appendix – G.

The researcher had administered teaching programme on two groups of std. 7th in two schools simultaneously from 02-07-2012 to 03-08-2012 except Sunday and holiday. The post test of writing taken on 03-08-2012.

Table 3.5

<table>
<thead>
<tr>
<th>Days</th>
<th>Date</th>
<th>Day</th>
<th>Topic</th>
<th>Experi. Group Time</th>
<th>Conv. Group Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2/7/12</td>
<td>Monday</td>
<td>Basic Maths (Addition-Subtraction)</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>2</td>
<td>3/7/12</td>
<td>Tuesday</td>
<td>Basic Maths (Multiplication)</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>3</td>
<td>4/7/12</td>
<td>Wednesday</td>
<td>Basic Maths (Division)</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>4</td>
<td>5/7/12</td>
<td>Thursday</td>
<td>Miscellaneous Examples</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>5</td>
<td>6/7/12</td>
<td>Friday</td>
<td>Simple Interest (Year)</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>6</td>
<td>7/7/12</td>
<td>Saturday</td>
<td>Simple Interest (Month)</td>
<td>9-40 to 10-20</td>
<td>8-30 to 9-10</td>
</tr>
<tr>
<td>7</td>
<td>9/7/12</td>
<td>Monday</td>
<td>Simple Interest (Day)</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>8</td>
<td>10/7/12</td>
<td>Tuesday</td>
<td>Simple Interest (Year-Month-Day)</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>9</td>
<td>11/7/12</td>
<td>Wednesday</td>
<td>Equation Based Examples</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>10</td>
<td>12/7/12</td>
<td>Thursday</td>
<td>Equation (Applied Examples)</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>11</td>
<td>13/7/12</td>
<td>Friday</td>
<td>Equation (Applied Examples)</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>12</td>
<td>14/7/12</td>
<td>Saturday</td>
<td>Equation (Applied Examples)</td>
<td>8-30 to 9-10</td>
<td>9-40 to 10-20</td>
</tr>
<tr>
<td>13</td>
<td>16/7/12</td>
<td>Monday</td>
<td>Square based Examples</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>14</td>
<td>17/7/12</td>
<td>Tuesday</td>
<td>Square root based Examples</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>15</td>
<td>18/7/12</td>
<td>Wednesday</td>
<td>Square root based Examples</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>16</td>
<td>19/7/12</td>
<td>Thursday</td>
<td>Square and Square root</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>17</td>
<td>20/7/12</td>
<td>Friday</td>
<td>Volume of a Cube</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>18</td>
<td>21/7/12</td>
<td>Saturday</td>
<td>Volume of a Cuboid</td>
<td>9-40 to 10-20</td>
<td>8-30 to 9-10</td>
</tr>
<tr>
<td>19</td>
<td>23/7/12</td>
<td>Monday</td>
<td>Applied Examples of Cube</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>20</td>
<td>24/7/12</td>
<td>Tuesday</td>
<td>Cube and Cuboid Examples</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>21</td>
<td>25/7/12</td>
<td>Wednesday</td>
<td>Polynomials (Addition)</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>22</td>
<td>26/7/12</td>
<td>Thursday</td>
<td>Polynomials (Addition)</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>23</td>
<td>27/7/12</td>
<td>Friday</td>
<td>Polynomials (Subtraction)</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>24</td>
<td>28/7/12</td>
<td>Saturday</td>
<td>Polynomials (Addition-Subtraction)</td>
<td>8-30 to 9-10</td>
<td>9-40 to 10-20</td>
</tr>
<tr>
<td>25</td>
<td>30/7/12</td>
<td>Monday</td>
<td>Polynomials (Multiplication)</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>26</td>
<td>31/7/12</td>
<td>Tuesday</td>
<td>Formula based Examples</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>27</td>
<td>1/8/12</td>
<td>Wednesday</td>
<td>Applied Based Examples</td>
<td>2-30 to 3-20</td>
<td>1-10 to 1-50</td>
</tr>
<tr>
<td>28</td>
<td>1/8/12</td>
<td>Thursday</td>
<td>of Polynomials</td>
<td>1-10 to 1-50</td>
<td>2-30 to 3-20</td>
</tr>
<tr>
<td>29</td>
<td>3/8/12</td>
<td>Friday</td>
<td>Post Test</td>
<td>12-00 to 1-30</td>
<td>2-30 to 4-00</td>
</tr>
</tbody>
</table>

3.14 Procedure of Data Collection

Pre – achievement was considered as covariates in the present study. So the data regarding these variables were required. Hence, after selecting two groups was
administered and pre – achievement result sheet of Mathematics subject of annual exam of std. 6 was collected from the school principal.

After implementing the programme, the post test was administered to all the two groups. Both post-test content were same but the instructions are different.

After administration of each of the tool, the responses of the subjects of each tool were scored according to the respective scoring key.

3.15 Data collected

After the experiment and scoring of each subject, total 98 final data were taken. Final 98 subjects were used for further analysis in order to test the hypotheses.

3.16 Analysis of Data

The main objective of the present study was to study the effect of Vedic Mathematical Techniques and Conventional Mathematical Techniques. The variables standard, content, medium were controlled in all the groups. Subjects were made equal regarding pre – achievement marks of Mathematics subject and post-test marks to find the correlation of these two groups. Here ANCOVA was used to study the significance of the difference between two groups eliminating the effect of the covariates. Mathematics Interest Inventory tools used to find the interest in Mathematics. Calculate Chi-square and study the difference is significance or not. Also apply Assignment Test used to find the accuracy. The SPSS programme was used for data analysis.
Endnotes


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