CHAPTER - III

METHODOLOGY

3.1. INTRODUCTION

In order to draw meaningful results from the analysis of data, an appropriate sampling design has to be followed. The selection of tools of analysis has to be done with greater care for substantiating the results empirically and also to arrive at appropriate policy implications of the study. In short, a proper design is essential to conduct research in the right direction. Therefore, this chapter gives an overall idea of the producers used by the investigator in conducting this experimental study. It deals with the method of study, population of the study, sample of the study, sampling technique, nature and size of the sample, procedure informing equated groups and design of the study.

3.2. METHODOLOGY

The success of any research depends largely on the suitability of the method and the tools and the techniques adopted. It lays out the way that formal research is to be carried out outlines the detailed description of the research variables and the procedures. It enables the investigator to look at the problem in a meaningful and orderly way. Methodology occupies a unique place in an educational research programme. A pre-planned and well described methodology is necessary for arriving at reliable and valid findings. The validity and the reliability of the findings depend upon the methods adopted. Methodology is the science of methods or principles of procedures. “It is the process of arriving at dependable solutions to problems through planned and systematic collection, analysis and interpretation of data, the need for adopting the right method for carrying out a study is important”.  

91
Methodology identifies the entire research plan. It is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it, one studies the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them.

In general five kinds of research methods are followed in educational research.

1. Historical method
2. Survey method
3. Case study
4. Genetic method
5. Experimental method

3.3. EXPERIMENTAL METHOD

The best method indeed the fully compelling method of establishing caution is to conduct a carefully designed experiment in which the effects of possible lurking variables are controlled. To experiment means to actively change ‘x’ and to observe the response ‘y’.

In conducting an experiment, the researcher devotes great care to the manipulation and control of variables to the observation and measurement of results. It is through such a research method that the researcher can obtain the most convincing evidence of the effect that one variable has another. “The experimental method is the only method of research that can truly test hypotheses concerning cause and effect relationships. It represents the most valid approach to the solution of educational problems, both practical and theoretical and to the advancement of education as a care”.
The experimental method is a systematic and scientific approach to research in which the researcher manipulates one or more variables and controls and measures any change in other variables. Experimental research is often used where:

1. There is time priority in a causal relationship (cause precedes effect).
2. There is consistency in a causal relationship (a cause will always lead to the same effect).
3. The magnitude of the correlation is great.

**Characteristic of an Experimental Method**

There are three essential ingredients with which the scientist is actively involved in the conduct of an experiment that is, control, manipulation and observation.

**Control**

Control is essence of the experimental method. Without control, it is impossible to evaluate unambiguously the effects of an independent variable. The purpose of control in an experiment is to arrange a situation in which the effect of variables can be established.

**Manipulation**

The manipulation of a variable refers to a deliberate operation performed by the experimenter. In educational research and other behavioral sciences, the manipulation of a variable takes characteristics from in which the experimenter imposes a predetermined set of varied conditions on the subject. One may manipulate a single variable or a number of variables simultaneously.

**Observation**

In experimentation, one interested in the effect of the manipulation of the independent variable on a response variable. Observations are made with respect
to some characteristics of the behavior of the subjects employed in research. These observations, which are quantitative in nature if possible, are the dependent variable.

3.4. METHOD ADOPTED FOR THE STUDY

The nature of the problem and the objectives framed for the study determined the method of getting the achievements of the students. The method adopted by the investigator should be adequate enough to study the entire intricacies involved research problem. The method adopted should be in turn with scientific principles and should be adequate enough to provide valid generalizations.

The method adopted in the present study was experimental method. In educational research, experimental method is the application and adaptation of the classical method of the science laboratory. It has been effectively applied within non-laboratory settings such as classrooms, where significant factors or variables can be controlled to some degree. Experimental method clarified clearly the effectiveness of specific method through the achievement of the students therefore; the researcher has selected the “Experimental Method”.

Research method is systematic process of collecting and analyzing information. The method should be selected based on the purpose and approaches of the study. The aim of the research is to find out the impact of different teaching methods in mathematics among matriculation higher secondary and government higher secondary students in terms of background variables. The issues involved in the problem are sharpened by formulating hypotheses and ascertaining the consequences that are logically implied by them. A test is then devised to ascertain whether the consequences that should occur if the hypotheses are to be confirmed are actually observable. The procedures of an experiment are to be executed with the
greatest care. The following list will give a more comprehensive picture of the experimental method to do:

i. Identifying, defining and delimiting the problem
ii. Reviewing the literature
iii. Formulating hypotheses and deducing their consequences
iv. Drawing up the experimental design
v. Defining the population
vi. Carrying out the study
vii. Measuring the outcomes
viii. Analyzing and interpreting the outcomes
ix. Drawing up the conclusions
x. Reporting the results

Experimental design is the design of any information gathering exercises where variation is present, whether under the full control of the experimenter or not.

3.5. EXPERIMENTAL DESIGN

Experimental design is the blueprint of the procedures that enable the researcher to test hypotheses by reaching valid conclusions about relationships between independent and dependent variables. Experimental designs vary in complexity and adequacy depending on such factors as the nature of the problem under investigation, the nature of data, the facilities for carrying out the study and especially the research sophistication and competence of the investigator.
Although there are a number of combinations of the various experimental procedures, the basic designs are:

i. The single-group design

ii. The parallel-group design

iii. The rotation-group design

iv. The factorial design

The research design is the master plan specifying the methods and procedures for collecting and analyzing the needed information. Although every problem and research objective may seem unique, there are usually enough similarities among problems and objectives to allow decisions to be made in advance about the best plan to resolve the problem. There are some basic marketing research designs that can be successfully matched to given problems and research objectives.

Three traditional categories of research design:

- Exploratory
- Descriptive
- Causal

The choice of the most appropriate design depends largely on the objectives of the research and how much is known about the problem and these objectives.

The investigator used the factorial experimental design. To determine the variations among the selected students on different teaching methods in mathematics, the analysis of variance for 2 x 3 x 2 factorial experiment with repeated measures on the last factor (pre and post test) was used with respect to the categories
such as gender and medium of instruction and the analysis of variance for 3 x 3 x 2 factorial experiment with repeated measures on the last factor (pre and post test) was used with respect to the categories such as type of school and type of management.

Research design is a planning stage of research which is usually made logically visualizing its practicability.

3.6. NEED FOR THE STUDY

The house of education which one wants to build is of course going to be different than the one in which all are living till this time. One knows that the present cottage does not fulfill our needs at present and certainly not giving to cater for the needs in the coming decade said Shri. I. J. Patel, President Indian Association for programmed learning in his key note address at the fourth annual conference on programmed learning and educational technology at Bombay (Mohanty, Jagannth, 1992, P.1). Now-a-days in education, it is realized learning is more important than teaching; learning is concerned with pupils and teacher. In the olden days teacher was the only source of knowledge. The students learnt what the teacher taught with the advent of text books and other learning aids, the teachers personal knowledge, though important ceased to be the only or even the paramount source of learning.

The traditional classroom with one teacher teaching thirty or forty students was mainly one way communication of information and is no way effective for modern condition. The two general factors "Information explosion” and "Population explosion" are bringing about changes in the developed and developing countries in more or less degree. Science and technology are playing a significant role in the formation of this modern civilization and the acculturatesations of the society. Day by day the increasing scientific and technological impact upon human-life
activities is developing the scientific attitude of the individuals in society. And in turn the society has begun to adopt the scientific and technological principles as well as to apply their results in every fields of life with the intention to achieve a high significance.

In this continuum a new field has emerged and is termed as the educational technology the educationalist have conceived the educational technology as a science of teaching and method by which educational goal could be released. Due to the multidimensional development of educational technology, its innovations have made the teacher capable of communicating the knowledge and facts on the process of imparting education to his pupil within time than before under this approach so many functions of a man have been transferred to machines. Man can therefore get rid of various mechanical functions in the saved time one can get involved in further creative tasks.

Moreover play way method of teaching often makes learning a pleasurable activity. In this context learning the basic concepts of science through games makes learning not only easier and effective but the concept are also retained in the long term memory of a learner. In view of the importance said above on different teaching methods in mathematics this study is organized in Kanyakumari District, Nagercoil Educated District on the matriculation higher secondary and government higher secondary students.

3.7. STATEMENT OF THE PROBLEM


98
3.8. OPERATIONAL DEFINITIONS OF KEY TERMS

Impact

Impact means the effect. In this study assess the impact of different teaching methods in mathematics.

Different Teaching Methods

Every teacher wishes to be an excellent one. But each falls somewhat short of his aspirations. There are varied reasons for this gap between teacher’s desired excellence and actual performance. In some cases the gap is caused by an inability to maintain order in class. But after poor teaching is due to a lack of skill is selecting and using teaching methods. In this study the investigator used three methods. They are conventional method, co-operative learning and multimedia learning methods.

Teaching Mathematics

Teaching is an activity or group of activities undertaken to help an individual or individuals to learn or acquire some knowledge, skills, attitudes, interest etc. The ultimate goal of teaching is to bring all round development in an individual. Teaching Mathematics or Mathematics Instruction refers to the act of providing activities, materials and guidance that facilitate learning Mathematics.

Matric. Higher Secondary Students

Students studying in XI and XII standards are called Higher Secondary School students. Students are admitted in XI standard after having passed the X standard (S.S.L.C.). The schools having sixth standard to twelfth standard are called Matriculation Higher Secondary Schools. In these schools the medium of instruction is English only.

Higher Secondary School Students
Students studying in XI and XII standards are called Higher Secondary School students. Students are admitted in XI standard after having passed the X standard (S.S.L.C.). The schools having sixth standard to twelfth standard are called Government Higher Secondary Schools. In these schools the medium of instruction is Tamil only.

3.9. OBJECTIVES OF THE STUDY

General Objectives

The main objective of the study was to find out the impact of different teaching methods in mathematics among matric. higher secondary and higher secondary school students of Nagercoil Educational district in Kanyakumari district in Tamil Nadu.

Specific Objectives

1. To find out whether any significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to type of management irrespective of method of teaching and tests.

2. To find out whether any significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to method of teaching irrespective of type of management and tests.

3. To find out whether any significant difference between the mean scores pre and post tests on mathematics of selected matric. higher secondary and higher secondary school students irrespective of type of management and method of teaching.
4. To find out whether any significant difference among the mean scores of mathematics in the interaction of type of management x method of teaching irrespective of tests, type of management x tests irrespective of method of teaching, method of teaching x tests irrespective of type of management and type of management x method of teaching x tests of selected matric. higher secondary and higher secondary school students.

5. To find out whether any significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to type of school irrespective of method of teaching and tests.

6. To find out whether any significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to method of teaching irrespective of type of school and tests.

7. To find out whether any significant difference between the mean scores pre and post tests on mathematics of selected matric. higher secondary and higher secondary school students irrespective of type of school and method of teaching.

8. To find out whether any significant difference among the mean scores of mathematics in the interaction of type of school x method of teaching irrespective of tests, type of school x tests irrespective of method of teaching, method of teaching x tests irrespective of type of school and type of school x method of teaching x tests of selected matric. higher secondary and higher secondary school students.
9. To find out whether any significant difference between the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to gender irrespective of method of teaching and tests.

10. To find out whether any significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to method of teaching irrespective of gender and tests.

11. To find out whether any significant difference between the mean scores pre and post tests on mathematics of selected matric. higher secondary and higher secondary school students irrespective of gender and method of teaching.

12. To find out whether any significant difference among the mean scores of mathematics in the interaction of gender x method of teaching irrespective of tests, gender x tests irrespective of method of teaching, method of teaching x tests irrespective of gender and gender x method of teaching x tests of selected matric. higher secondary and higher secondary school students.

13. To find out whether any significant difference between the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to medium of instruction irrespective of method of teaching and tests.

14. To find out whether any significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to method of teaching irrespective of medium of instruction and tests.

15. To find out whether any significant difference between the mean scores pre and post tests on mathematics of selected matric. higher secondary and higher secondary school students irrespective of medium of instruction and tests.
16. To find out whether any significant difference among the mean scores of mathematics in the interaction of medium of instruction x method of teaching irrespective of tests, medium of instruction x tests irrespective of method of teaching, method of teaching x tests irrespective of medium of instruction, and medium of instruction x method of teaching x tests of selected matric. higher secondary and higher secondary school students.

3.10. HYPOTHESES OF THE STUDY

1. There is no significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to type of management irrespective of method of teaching and tests.

2. There is no significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to method of teaching irrespective of type of management and tests.

3. There is no significant difference between the mean scores pre and post tests on mathematics of selected matric. higher secondary and higher secondary school students irrespective of type of management and method of teaching.

4. There is no significant difference among the mean scores of mathematics in the interaction of type of management x method of teaching irrespective of tests, type of management x tests irrespective of method of teaching, method of teaching x tests irrespective of type of management and type of management x method of teaching x tests of selected matric. higher secondary and higher secondary school students.
5. There is no significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to type of school irrespective of method of teaching and tests.

6. There is no significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to method of teaching irrespective of type of school and tests.

7. There is no significant difference between the mean scores pre and post tests on mathematics of selected matric. higher secondary and higher secondary school students irrespective of type of school and method of teaching.

8. There is no significant difference among the mean scores of mathematics in the interaction of type of school x method of teaching irrespective of tests, type of school x tests irrespective of method of teaching, method of teaching x tests irrespective of type of school and type of school x method of teaching x tests of selected matric. higher secondary and higher secondary school students.

9. There is no significant difference between the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to gender irrespective of method of teaching and tests.

10. There is no significant difference among the mean scores of mathematics of selected matric. higher secondary and higher secondary school students with respect to method of teaching irrespective of gender and tests.

11. There is no significant difference between the mean scores pre and post tests on mathematics of selected matric. higher secondary and higher secondary school students irrespective of gender and method of teaching.

12. There is no significant difference among the mean scores of mathematics in the interaction of gender x method of teaching irrespective of tests, gender x tests
irrespective of method of teaching, method of teaching x tests irrespective of
gender and gender x method of teaching x tests of selected matric. higher
secondary and higher secondary school students

13. There is no significant difference between the mean scores of mathematics of
selected matric. higher secondary and higher secondary school students with
respect to medium of instruction irrespective of method of teaching and tests.

14. There is no significant difference among the mean scores of mathematics of
selected matric. higher secondary and higher secondary school students with
respect to method of teaching irrespective of medium of instruction and tests.

15. There is no significant difference between the mean scores pre and post tests on
mathematics of selected matric. higher secondary and higher secondary school
students irrespective of medium of instruction and tests.

16. There is no significant difference among the mean scores of mathematics in the
interaction of medium of instruction x method of teaching irrespective of tests,
medium of instruction x tests irrespective of method of teaching, method of
teaching x tests irrespective of medium of instruction, and medium of
instruction x method of teaching x tests of selected matric. higher secondary and
higher secondary school students.

3.11. VARIABLES SELECTED FOR THE STUDY

A variable is something that can be changed, such as a characteristic or
value. Variables are generally used in experiments to determine if changes to one
thing result in changes to another. The factors which affects the observed
phenomenon but cannot be seen and measured or manipulated, its effects must be
inferred from the effects of the independent variable on the observed phenomena.
Intervening variables interfere with the independent and dependent variables, but its effects can either strengthen or weaken the independent and dependent variables.

The variables selected for the study are as follows:

1. Type of Management (Government, Government Aided and Matriculation)
2. Type of School (Boys, Girls and Co-Education)
3. Medium of Instruction (Tamil and English) and
4. Gender of the Students (Male and Female)

The definition of the problem is really the planning of the investigation with an indication of the data and techniques needed to answer.

3.12. SELECTION OF THE STUDY AREA

The study area is Kanyakumari District, Nagercoil Education District. This District is purposively chosen in order to get proper samples in view of the familiarity which the researcher has in this area. Kanyakumari, the smallest district of Tamilnadu, lying in the south end of India is also the southernmost tip of South East Asia, with the area occupied is 1671.85 square k.m. This district lies between 77.05 and 77.36 of the eastern longitude and 8.03 degree and 8.05 degree of the northern latitude. With the reorganization of provinces of India on linguistic basis on 1st November 1956 it was separated from the Travancore Cochin state and merged with Tamilnadu.

The headquarters of Kanyakumari District are Nagercoil. This District is bounded by Tirunelveli District in the north and in the north east by Thiruvananthapuram District of Kerala state in the North West the Bay of Bengal. The Indian Ocean is in the south and the Arabian Sea in the west. The district is situated
at the foot of the Western Ghats and has a definite slope from east towards west. The
district has three Educational districts namely Nagercoil, Thuckalay and Kuzhithurai
having 401 Primary Schools, 157 Middle Schools, 123 High Schools and 123 Higher
Secondary Schools. This district has been segmented into Nine Blocks (union) namely.

1. Agasteeswaram
2. Rajakamangalam
3. Thovalai
4. Kurunthencode
5. Thuckalay
6. Thiruvattar
7. Melpuram
8. Munchirai
9. Killiyoor

The climatic conditions and the topographic nature make the district an
agricultural land to grow a number of crops. So the main occupation of the people is
only agriculture. Naturally the economic condition of the people is just average.
More over this district is industrially backward. So there is no scope for getting
employment opportunities throughout the year. Most of the people are agricultural
labourers. In the sea-cost most of the people are engaging themselves in fishing.

3.13. TEACHING METHODS USED

The investigator selected for the study is three teaching methods, viz.,

a) Conventional Teaching Method
b) Co-operative Learning Method and
c) Multimedia Learning Method
In order to assess the initial background of the students a general knowledge test on the Mathematics was constructed and administered to all the students simultaneously. The test revealed that irrespective of the gender difference and the medium of instruction all the students have almost identical score. This ascertained the uniformity in the sampling adopted.

3.14. POPULATION FOR THE STUDY

The aggregate of all the units pertaining to study is called the population or the universe. Population is the target group to be studied. According to John W. Best and James V. Kahn (1992) “A population is any group of individuals that have one or more characteristics is common that are of interest to the researcher. The population may be all the individuals of a particular type, or a more restricted part of that well defined group” (p.11). The population of this study is all higher secondary school students (XI and XII std) in Kanyakumari District, Nagercoil Education District.

3.15. SAMPLE FOR THE STUDY

The process of drawing a sample from a larger population is called sampling. The investigator adopted simple random technique to select the sample. In this type of sampling the investigator decided which units to include or exclude in the sample. To judge or select the samples, the investigator conducted general knowledge test on the Mathematics determined by a standardized test.

The total students selected for this investigation was three hundred and sixty students from six schools, 60 students from each school. The selected schools
and details of the sample were listed and described in the previous chapter. The selected students (N=360) from the selected area were analysed in four categories such as with respect to gender, medium of instruction, type of school and type of management. Further, the students were experimented by into three types of teaching method in mathematics each one hundred and twenty students, namely conventional method, co-operative learning method and multi-media learning method.

The number of students in each school is 60. The details of total samples are given below in Table 3.1.

Table 3.1 Sample details

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the School</th>
<th>School details</th>
<th>Medium of feedback</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>1</td>
<td>S.M.R.V Hr.Sec.School, Vadasery.</td>
<td>Aided</td>
<td>English/Tamil</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>D.V.D Hr.Sec.School, Kottar</td>
<td>Aided</td>
<td>English/Tamil</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>S.L.B Govt. Hr.Sec.School, Nagercoil</td>
<td>Govt.</td>
<td>Tamil</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>Govt. Hr.Sec.School, Vadasery</td>
<td>Govt.</td>
<td>Tamil</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>C.S.I Matriculation Hr. Sec.School, Nagercoil</td>
<td>Matric.</td>
<td>English</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>Adharsh Matriculation Hr. Sec.School, Nagercoil</td>
<td>Matric.</td>
<td>English</td>
<td>30</td>
</tr>
</tbody>
</table>

From the table 3.1, indicated that, the total sample size of the study is 360.
Table 3.2
Distribution of sample in terms of background variables

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Category</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Type of Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Government Aided</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Matriculation</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>360</td>
</tr>
<tr>
<td>2.</td>
<td>Type of School</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Co-Education</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td></td>
<td>360</td>
</tr>
<tr>
<td>3.</td>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td>360</td>
</tr>
<tr>
<td>4.</td>
<td>Medium of Instruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tamil</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td>360</td>
</tr>
</tbody>
</table>

**Homogeneity of the Groups**

In any kinds of researches, before applying treatment, there is a necessity of testing homogeneity of groups. It is assumed that the variances in the different groups of the design are identical. The analysis of pre-test scores of the experimental group and control group showed that there is no significant covariance in the mathematics and in relation to academic achievement of experimental group higher secondary students in pre-test.
3.16. EXPERIMENTATION

Experimentation is a special type of investigation used to determine whether and in what manner variables are related to each other. It is concerned with determining whether there is any relationship between an independent and dependent variable. The investigator controls the educative factor to which a group of higher secondary students is subjected during the period of inquiry and observes the resulting achievement. The investigator must start the experiment with some measurement of the initial attainment of the higher secondary students in the trait or ability to be influenced. The investigator then subjects the group to the experimental factor, such as the particular type of training, for the duration of the experiment. At the end, the investigator applies a final test for the purpose of determining the gain in achievement that has resulted from the application of the experimental factor.

Experimentation is the classic method of the science laboratory, where elements manipulated and effects observed can be controlled. It has been effectively applied within non-laboratory settings such as the classroom, where significant factors or variables can be controlled to some degree. A treatment is something that researcher administers to experimental units. Treatment were given to both control group and experimental group by employing traditional and advanced techniques (discussion with package) respectively.

The experimental group higher secondary students got training through discussion with co-operative learning and multimedia package. Using package the investigator made the higher secondary students to realize the importance of mathematics and the discussion about the techniques to develop skills in their movements such as personal life, professional life and facing and cope up with the
critical situations in their life were carried out. The control group higher secondary students gained training through traditional method alone.

3.17. SCHEDULE FOR TREATMENT

In order to test the effectiveness of two teaching methods.

Viz: (i) Co-operative Learning Method and
(ii) Multimedia Learning Method

First a basic pretest was conducted. The selected subjects were tested on different teaching methods prior to and immediately after 10 days period by using the standardized test items. Finally post test was conducted.

A variety of regular shapes are introduced to students at this stage: triangles, circles, quadrilaterals, they offer a rich new mathematical experience in at least four ways. Children start looking for such shapes in nature, all around them, and thereby discover much symmetry and acquire a sense of aesthetics. Secondly, they learn how many seemingly irregular shapes can be approximated by regular ones, which becomes an important technique in science. Thirdly, they start comprehending the idea of space: for instance, that a circle is a path or boundary which separates the space inside the circle from that outside it. Fourthly, they start associating numbers with shapes, like area, perimeter etc, and this technique of quantization, or arithmetization, is of great importance. This also suggests that mensuration is best when integrated with geometry.

An informal introduction to geometry is possible using a range of activities like paper folding and dissection, and exploring ideas of symmetry and transformation. Observing geometrical properties and inferring geometrical truth is the main objectives here. Formal proofs can wait for a later stage. Data handling, representation and visualization are important mathematical skills which can be taught
at this stage. They can be of immense use as “life skills”. Students can learn to appreciate how railway time tables, directories and calendars organize information compactly.

Mathematical terminology is highly stylised, self-conscious and rigorous. The student begins to feel comfortable and at ease with the characteristics of mathematical communication: carefully defined terms and concepts, the use of symbols to represent them, precisely stated propositions using only terms defined earlier, and proofs justifying propositions. The student appreciates how an edifice is built up; arguments constructed using propositions justified earlier, to prove a theorem, which in turn is used in proving more. For long, geometry and trigonometry have wisely been regarded as the arena wherein students can learn to appreciate this structure best. In the elementary stage, if students have learnt many shapes and know how to associate quantities and formulas with them, here they start reasoning about these shapes using the defined quantities and formulas.

Algebra, introduced earlier, is developed at some length at this stage. Facility with algebraic manipulation is essential, not only for applications of mathematics, but also internally in mathematics. Proofs in geometry and trigonometry show the usefulness of algebraic machinery. It is important to ensure that students learn to geometrically visualise what they accomplish algebraically. A substantial part of the secondary mathematics curriculum can be devoted to consolidation. This can be and needs to be done in many ways. Firstly, the student needs to integrate the many techniques of mathematics she has learnt into a problem solving ability. For instance, this implies a need for posing problems to students which involve more than one content area: algebra and trigonometry, geometry and mensuration, and so on.
Secondly, mathematics is used in the physical and social sciences, and making the connections explicit can inspire students immensely.

Thirdly, mathematical modelling, data analysis and interpretation, taught at this stage, can consolidate a high level of literacy. For instance, consider an environment related project, where the student has to set up a simple linear approximation and model a phenomenon, solve it, visualise the solution, and deduce a property of the modelled system. The consolidated learning from such an activity builds a responsible citizen, who can later intuitively analyse information available in the media and contribute to democratic decision making. At the secondary stage, a special emphasis on experimentation and exploration may be worthwhile. Mathematics laboratories are a recent phenomenon, which hopefully will expand considerably. Activities in practical mathematics help students immensely in visualisation.

Likewise all the three methods were taught through Mathematics to the sample schools. Then they can appear to their Mathematics Achievement Scale. Due to their achievement scores, the investigator analyzed it and found out a solution about the appropriate method for Mathematics teaching.

Research design Flow Chart

```
Pre Test

Method I  Method II  Method III

Post Test
```
Resources can be used to Prepare Mathematics Aids

Sticks, corks, bottle tops, cloth, matchboxes, envelopes, shells, string, rubber bands, drawing pins, beads, pebbles, shoe laces, buttons, old coins, seeds, pots and pans, washing line, newspaper, old magazines, paper and card, twigs, odd pieces of wood, old cardboard boxes and cartons, clay, tins, bags, bottles, people and most importantly, the mind. There are many other things that you will be able to find around the school and local community.

Most traditional communications media including telephone, music, film, and television are reshaped or redefined by the Internet, giving birth to new services such as Voice Over Internet Protocol (VOIP) and IPTV. Newspaper, book and other print publishing are adapting to Web site technology or are reshaped into blogging and web feeds. The Internet has enabled or accelerated new forms of human interactions through instant messaging, Internet forums, and social networking. Online shopping has boomed both for major retail outlets and small artisans and traders. Business-to-business and financial services on the Internet affect supply chains across entire industries.

3.18. TOOLS USED FOR THE STUDY

The investigator used the following tools in this experiment. They are;

1. Pre test, Post test questions
2. Multimedia Package and
3. Lesson Plan

These tools were administered by the following the instructions given below.
3.18.1. CONSTRUCTION OF PRE TEST POST TEST QUESTIONS

Questions of objective type nature were framed covering all the selected three units. Multiple choices were the types of questions used in this achievement test. The questions were framed so as to suit the level of XI and XII students. The items selected from “Calculus” Syllabus. Utmost care was taken to avoid ambiguity and ambivalence. The items included in the final form of achievement test were selected on the basis of item analysis. Initially 75 questions of objective type in nature were framed for tryouts. 100 percent multiple choice test items were framed for the achievement test and the final form consists of only 50 questions; for the reason of removal of above 80% and below 20% difficulty index and discriminating power.

Multiple choice test items were composed of a stem followed by a series of possible responses or options. The stem is a direct question or an incomplete statement with four options of which only one is the correct response. Due importance and weightage, the investigator has given to multiple choice test items because its level of difficulty can be varied with relative ease, and it is capable of reflecting simple student behavioural patterns such as recall of information as well as complex student behavioural patterns such as the ability to analyse and synthesise.

3.18.2. MULTI MEDIA PACKAGE

Package means collection of objects. In this package the investigator prepared the concepts of Calculus in Mathematics were included. Power Point Presentation and Video clips on the above concepts were collected from various sources such as cinema and short films. The investigator took one month to collect these video clips and edit it and get final form. This package is enclosed in the last
page of this dissertation. The investigator got interest to prepare package and done this study using experimental method.

3.19. ADMINISTRATION OF THE TOOLS

After careful planning of the experimental method, the investigator got permission from the respected school head masters and head mistress in Kanyakumari District, Nagercoil Education District, to conduct the study. The investigator explained the purpose of the study and created a rapport with the students to avoid fear of testing. The instructions were carefully read out and explained to the higher secondary students. They were instructed to respond by listening. The students were asked to answer all the tools namely pre test post test questions and multimedia package including personal data and submit the same promptly. The filled in tools were scored and the data were entered. Thus the pre test was conducted. After treatment post test was conducted like the pre test and the scored data were tabulated for analysis with the help of SPSS package.

3.20. STATISTICAL TECHNIQUES USED

The details of the analysis used are presented here. They are:

a) Simple arithmetic mean

b) Standard deviation

c) Simple correlation

d) Paired 't' test

e) ANOVA

f) Scheffe’s test

To determine the variations among the selected students on different teaching methods in mathematics, the analysis of variance for $2 \times 3 \times 2$ factorial
experiment with repeated measures on the last factor (pre and post test) was used with respect to the categories such as gender and medium of instruction and the analysis of variance for 3 x 3 x 2 factorial experiment with repeated measures on the last factor (pre and post test) was used with respect to the categories such as type of school and type of management. Whenever the 'F' ratio for interaction was found to be significant, simple effect test was used as a post hoc test to determine which of the group was significant and whenever the 'F' ratio for interaction was found to be significant in the simple effect test, Scheffe’s effect test was used as a post hoc test to determine which of the paired means were significant. In all the cases 0.05 level was fixed as significant level to test the hypothesis.

**a. Simple arithmetic mean**

Simple arithmetic mean otherwise called the centre of gravity or Location parameter or the measure of the central tendency denoted by $\bar{x}$ is computed by the formula.

$$\bar{x} = \frac{\sum xi}{n}$$

where $n$, is the size of the sample, $i$ varying through all the measured observations. This is used to know the central tendency of each one of the variables considered.

**b. Standard deviation**

The measure of dispersion denoted by $s$ is used to find how the different observations in each one of the variables used in the study varies around the centre of the distribution. This is computed by the formula.

$$S = \sqrt{\frac{1}{n} \sum (xi - \bar{x})^2}$$
c. Simple Correlation

Simple Correlation is used to find the association or strength of relation between pairs of variables. It is computed by the formula

\[
r = \frac{1}{n} \sum \left( x - \bar{x} \right) \left( y - \bar{y} \right) / \text{(S.D of } x \text{. S.D. of } y)\]

Where S.D stands for Standard Deviation

\[
r \text{ is tested by the formula } t = r \sqrt{n - 2} / \sqrt{1 - r^2}
\]

d. Paired ‘t’ test

To study the significant difference between means of pre test and post test scores,

\[
t = \frac{D - 0}{\sigma_{\text{diff}} / n}
\]

\( \bar{D} \) - Mean of differences

If the values from paired samples are denoted as \( X_i \) and \( Y_i \) and differences by \( D_i (D_i = X_i - Y_i) \) then the mean of differences i.e.

\[
\bar{D} = \frac{\sum D_i}{n}
\]

\[
\begin{align*}
\left( \sigma_{\text{diff}} \right)^2 &= \frac{\sum D_i^2 - (D)^2.n}{n - 1} \\
\sigma_{\text{diff}} &\text{ - Standard deviation of the differences} \\
n &\text{ - Number of matched pairs}
\end{align*}
\]
e. **ANOVA**

ANOVA or an analysis of variance is used to test the difference of several means and also to test the overall effect of the different methods with respect to gender and medium. Here Computation was done with the help of SPSS package.

The data thus obtained were analysed by using appropriate statistical techniques such as mean, standard deviation and ‘t’ - test. At the first stage, distribution and classification of students on the basis of gender, medium of instruction and locality were carried out. In the second stage, mean and standard deviation (S.D.) and ‘t’ test and F test of pre-test and post-test scores were calculated per each method. Based on mean and SD, t-values were calculated to know and interpretation are presented in the chapter-IV.

**3.21. DELIMITATIONS OF THE STUDY**

Delimitations are the boundaries of the study. The researcher delimits the study by putting the following boundaries:

1. The study is confined to higher students only in Government, Matriculation and Aided higher secondary schools of Kanyakumari District of Tamil Nadu State in India.

2. The sample consists of 360 students only selected on the basis of observations of teacher and parents, Mathematics curriculum based assessment and on the basis of their response to the checklist.

3. Three units from Mathematics in XI and XII Standard prescribed by Tamil Nadu Text book society are only included for the study and

4. Two different teaching methods were only used in this study.
3.22. CONCLUSION

In this chapter the investigator provided information in relation with the design of the study including the methodology and procedure for conducting the study that is experimentation, data collection and the pattern of data analysis to know the impact of different teaching methods in mathematics among matric. higher secondary students and government higher secondary students. The data collected, were put to the statistical analysis with the tabular columns and the interpretations are discussed in the succeeding chapter.