CHAPTER FOUR

RESEARCH METHODOLOGY
CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction
4.2 Methods of Research
4.3 Variables of the Study
4.4 Population and Sample
4.5 Selection of the sample
4.6 Administration of the tools
4.7 Statistical Technique

REFERENCES
CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

Research methodology or research design is the plan, structure, and strategy of investigation conceived so as to obtain answer to research questions and to control variance.¹

Since science attempts to investigate particular section or aspect of reality, with an abstract system of thought to interpret those segments it should not be surprising that each science develops its own terms, or concepts, for communicating its findings.²

Scientific methodology is vital to the objective and quantitative research in social sciences. Before conducting a scientific research in social science, one must formulate a proper paradigm to collect the relevant information and to analyse it in a meaningful way. The appropriateness of an investigation depends on the tools of data collection, representativeness of the sample and the statistical devices, which one employs to analyse the data to arrive at reliable and valid conclusions and generalisations that will help one to understand and predict the variables under study. To achieve this, an appropriate research paradigm is needed that minimises subjectivity and maximises the objectivity of the evidence collected.

The secret of our cultural development has been research, pushing back the areas of ignorance by discovering new truths, which in turn, lead to better ways of doing things and better products. There is no alternative to truth and therefore to research. To research is to get nearer to truth.

Educational research is considered to be a prominent key which is essential to the opening of new doors in education. Educational research must be squarely aimed at finding solutions to unsolved problems, at creating ways and at devising new media to meet certain functional needs which have never been met before, at finding better processes and content than those currently in vogue. It cannot be simply Library research; it must be research and development, tied to action.
4.2 Methods of Research

Any attempt to classify types of educational research poses a difficult problem. Four research methods are most common in educational research. Anyone of these categories could include research studies that are of a basic, applied, or action nature. 3

Actually, all research involves the elements of observation, description, and the analysis of what happens under certain circumstances. A rather simple four-point analysis may be used to classify educational research. Practically all studies fall under one, or a combination, of these types:

1. Historical research describes what was. The process involves investigating, recording, analyzing, and interpreting the events of the past for the purpose of discovering generalizations that are helpful in understanding the past and the present and, to a limited extent, in anticipating the future.

2. Descriptive research (quantitative) uses quantitative methods to describe what is, describing, recording, analyzing, and interpreting conditions that exist. It involves some type of comparison or contrast and attempts to discover relationships between existing nonmanipulated variables. Some form of statistical analysis is used to describe the results of the study.

3. Qualitative descriptive research uses nonquantitative methods to describe what is. Qualitative descriptive research uses systematic procedures to discover non-quantifiable relationships between existing variables.

4. Experimental research describes what will be when certain variables are carefully controlled or manipulated. The focus is on variable relationships. As defined here, deliberate manipulation is always a part of the experimental method.

There are four more complex methods of research devised lately, to study complex phenomena; these involve new purposes in the collection of data and new patterns of treatment. They employ entirely new modes either of procedure, or of new combinations of old procedures.
These methods are:

1. Causal-Comparative Method
2. Correlation Method
3. Case-Study Method
4. Genetic Method

According to the need and the objectives of the problem Descriptive method and Correlation Method are used in this study.

**Descriptive Method**

Descriptive research describes what is, describing, recording, analyzing, and interpreting conditions that exist. It involves some type of comparison or contrast and attempts to discover relationships between existing nonmanipulated variables. It includes Survey method.

Survey research is a method for collecting and analysing data, obtained from large number of respondents representing a specific population collected through highly structured and detailed questionnaire, or interviews. The researcher is usually interested in describing the population he is studying. The survey approach to educational problems is one of the most commonly used approaches. It is followed in studying local, as well as state, national and international aspects of education. It goes beyond mere gathering and tabulation of data. It involve interpretation, comparison, measurement, classification, evaluation and generalization all directed towards a proper understanding and solution of significant educational problems.

**Correlation Method**

The correlation method of research does not denote merely a statistical device of calculating coefficients of correlation between certain data. On the other hand, it is a research approach, which analyses the relationship between data, between variable and some results in such a way that the underlying pattern of relationships becomes clear. No doubt, this method utilizes the correlation technique of analysis. However, it goes far beyond it and includes many other
elements of a basic nature.

The correlation method is of modern origin, ranked high among research methods in education. Its place in sociological research is almost the same as that of the laboratory method in physical science research. This method is a definite improvement in the causal comparative and the experimental methods. It approaches the problem of cause and effect in terms of degrees, not only dichotomies. It deals with problems in terms of many variables and reflects the variation of many factors at once.

In the present work, to study the interest in science as well as ability in science Survey method was used while to study the relationship between interest and ability the correlation method was used.

4.3 Variables of the Study

A variable literally means a character or quality that varies among the members of a particular group. Variables are of three types they are:

1. Independent variables
2. Dependent variables
3. Controlled variables

The following variables are considered for the present study.

1. Independent variables
   - Sex of the students
   - Socio- Economic Status
   - Type of school
2. Dependent variables
   - Interest in science
   - Ability in science
3. Controlled variables
   - Age of the students
   - Tools for data collection
   - Administration of the tools
   - Evaluation of answer books
Independent variables

1. Sex of the students

(Boys verses Girls)

In olden days, the boys were educated and the girls were restricted to their kitchens by their adult community. Times changed and the adults and educators have recognised the importance of women’s education. We recognise that, if we educate a man we educate only one person; if we educate a woman we educate the entire family. In the course of time women’s education gained importance and many parents are encouraging their daughters to pursue higher education, and even allowing them to go abroad. The women are also showing excellence in all fields. Their presence is felt almost in all fields.

As the physiological conditions, exposure to society, education and other aspects of girls and boys vary differently, there may be a significant difference in the possession of interest in science as well as ability in science. The boys may be exposed to the society to a larger extent, but the girls spend most of their time in going through books or helping their parents at home. These factors will show their influence on their mental development, interest formation and development of the abilities.

It is especially important to study the level of possession of interest and ability in science of secondary school pupils because they just enter the adolescent stage, which is otherwise known as the period of stress and strain. At this stage, this student finds it extremely difficult to adjust them in the society because they are accepted neither as adults nor as children. It is also familiar that girls mature faster than boys at the early adolescent stage, both physically and mentally. The above factors will have their own impact on the possession of interest and ability in science. So, a comparison between boys and girls will reveal if any difference exists in the possession of interest in science and ability in science.
2. Socio- Economic Status  
(Middle SES verses Lower SES)

Environment plays a pivotal role in the development of the individual. Socio- Economic Status of the students comes under the environment of the individual, which also plays a vital role in the cognitive as well as affective development. Many studies have shown the impact of Socio-Economic differences on mental abilities, skills and cognitive and affective development. Evidence has also accumulated to how those certain Socio-Economic factors are frequently associated with below average intellectual functioning, poor school achievement, low level of aspiration, language disability, low level of interest and attitude etc. Since development is envisaged as an outcome of organism environment interaction, a defective environment (Socio Economic-Cultural environment) would affect cognitive and affective development. Hence, a child with different socio-economic background may have different cognitive as well as affective development; there may be the difference in their interest and ability in science.

As the Socio- Economic conditions of the parents which include their education, occupation and income are important in providing all facilities to the students for their education. The students from lower Socio- Economic group may obtain less facilities and services which are essential for their education than that of the students from middle or higher Socio- Economic group. These facilities and services include the books, type of school, tuitions, extra coaching, study of the students by their parents, personal attention of the parents. These factors will show influence on their interest formation and development of the abilities. Therefore the students from lower and middle Socio- Economic Status vary differently; there may be a significant difference in the possession of interest in science as well as ability in science.
3. Type of school

(Private aided verses Municipal Corporation schools)

The reputation of private aided schools is generally better when compared with that of the Municipal Corporation schools. In private aided schools the pupils are exposed to better conditions and better study atmosphere. If better facilities are not provided in private schools, the parents will question the authorities concerned. The infra-structural, facilities in the school like laboratory and library facilities will play a major role in the possession of interest in science as well as ability in science.

The quality of teaching is also supposed to be better in private aided schools. The teachers take more interest in teaching in private aided schools as they are immediately being questioned by the managements about the quality of their teaching. Since the standard of teaching is supposedly to be different in private aided and Municipal Corporation schools, the level of possession of interest in science as well as ability in science will be different.

Controlled variables

1. Age of the students: All the students who participated in the present study were between the ages of 14 to 15 years.

2. Tools for data collection: in this study the tools used for data collection were same i.e. Science Interest Test, Science Ability Tests and Socio-Economic Status Scale etc. were same for all the students.

3. Administration of the tools: The procedure for the administration of tools was uniform. These tools were administered to all the students by the same person to avoid the error variance due to persons and procedure.

4. Evaluation of answer books: Separate scoring keys were prepared by the researcher for uniform assessment of answer sheets of the students.
4.4 Population and Sample

Population

The primary purpose of research is to discover the principles that have universal application but to study the whole population in order to arrive at generalization would be impracticable if not impossible. Some populations are so large that their characteristics could not be measured because before the measurement could be completed the population could change.

A population is any group of individual that have one or more characteristics in common that are of interest to the researcher. The population may be all the individual of particular type or more restricted part of the group.

The population considered for this study was all the secondary school students in Maharashtra State.

Sample

A sample is a small proportion of the population selected for analysis. By observing sample certain inferences can be made about the population. Contrary to the popular opinion samples are not selected haphazardly but deliberately, so that the influence of chance or probability can be estimated.

The process of sampling makes it possible to draw valid inferences or generalization based on careful observation or manipulation within a relative small proportion of population.

Sampling

By studying the sample of defined population, educational research aims at making generalization, which can be applied, to the population. Borg defines, Perhaps the most important factor in determining the generalizability of research result is the selection of the sample used in collecting the research data.
Methods of Sampling

To obtain a sample representative of its population four main techniques have been devised: random, stratified or quota, incidental, and purposive.

1. Random Sampling

Sometimes termed as simple random sampling, sometimes as unrestricted random sampling, and sometimes as just random sampling, this form of device is one in which every single unit of the population has an equal chance of being selected. A simple random sample is drawn unit by unit. The population is numbered from 1 to N and a series of random numbers is drawn either by means of a table of random numbers.

2. Stratified or Quota Sampling

A modified form of random sampling, stratified or quota sampling, sometimes called controlled sampling, is a device, which ensures representativeness in selecting a sample from a population composed of subgroups or strata of different sizes. A good sample from such a population needs to contain individuals drawn from each category in accordance with the size of the subgroups. Within each subgroup, the sampling is random.

3. Incidental Sampling

Incidental, or sometimes called Accidental sampling, is a term which is applied when such groups are used as samples as are easily available, e.g. children in a school, an orphanage or a reformatory, students enrolled in particular classes, etc. The number and conditions of these groups are not chosen specifically for the purpose. Such groups are but poor samples of any definable population and adequate generalizations can hardly be based upon such data.
4. Purposive Sampling

As different from incidental sampling, purposive sampling is the device, which selects a particular group or category from the population to constitute the sample because this category is considered to mirror the whole with reference to the characteristic in question. For example, purposive sampling is used when the selected sample is constituted of all the newspaper editors of an area to represent the public opinion of that area. In this type of selection, the sample is restricted to units considered by someone to be especially typical of the population.

The sample for the present study was the secondary school students from twenty-nine schools. (Appendix G)

4.5 Selection of the sample

A sample should be representative of the population. There are various techniques or methods to have a representative sample. The sample should not be only representative but also should be adequate (i.e. lack of bias). Adequacy of a sample depends upon test researchers’ knowledge of the population and the methods used in drawing the sample.

For having representative and adequate sample, size of the sample was decided. There were 147 Marathi medium high schools (Private aided schools and Municipal Corporation schools) in the Pune city (June 2002) i.e. Pune Municipal Corporation area for which the research was restricted. The students studying in Std. IX during the academic year 2002-2003 was the population for this study.

To have a representative sample it was felt necessary to cover all types of schools. Since the area of research was limited, all the schools in that particular area were selected. It included private schools of boys, girls’ and coeducational schools, Pune Municipal Corporation schools of boys’ girls’ and coeducational. The number of students of Std. IX in each school and number of divisions of Std. IX were studied.
It was observed that number of divisions vary from one to eight, while in most of the corporation schools there was only one division. The schools in which there was only one division all students were selected. Out of 2 or 3 divisions one division was selected and from the schools having more divisions all the students from two divisions were selected. The procedure of selection of the divisions is given below.

1. All the students from the schools having one division were selected.
2. The private schools were arranged in alphabetical order.
3. Number of divisions of Std. IX were written against the name of each school.
4. Divisions were then numbered as 1, 2, 3, ----etc. up to 8.
5. Number of divisions to be selected from each school was finalized.

The schools selected for the administration of the final form, type and numbers of schools are given in table.

Table No. 4.1
Type and number of schools selected for administration of the tests

<table>
<thead>
<tr>
<th>Type of school</th>
<th>Boys School</th>
<th>Girls School</th>
<th>Co-education School</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private aided School</td>
<td>08</td>
<td>08</td>
<td>07</td>
<td>23</td>
</tr>
<tr>
<td>Muncipal Corporation School</td>
<td>01</td>
<td>01</td>
<td>04</td>
<td>06</td>
</tr>
<tr>
<td>Total</td>
<td>09</td>
<td>09</td>
<td>11</td>
<td>29</td>
</tr>
</tbody>
</table>
The population, sampling frame, sample, and element

In present study, the population was IX standard students enrolled in secondary schools in Maharashtra state, while the sampling frame was IX standard students enrolled in secondary schools of Pune city during year 2002-2003. The sample includes 1454 Students from Secondary schools in Pune city and every student from the sample was the element for the study. This is presented in the following figure.

The random method of sampling was used for selection of the schools, while for the selection of students from each school incidental sampling was utilised. Thus, the schools and the divisions for the administration of the tool were decided. Prior permission from the school authorities was taken. The tools were administered as per the schedule prepared by the researcher.
4.6 Administration of the tools

Administration of the final form of the tools is an important stage of the research. The purpose of -

- Adaptation of Science Interest Test (SIT) is to find students’ interest in science,
- Construction of Science Ability Test (SAT) is to find students’ ability in science and
- Construction of Socio-Economic Status Scale (SESS) is to find students’ Socio-Economic Status.

After the administration of these tools, one can study the students’ interest and ability in science and their correlation as per the following

i) All students,
ii) Sex-wise,
iii) According to the students’ Socio-Economic Status and
iv) According to the type of the school.

For the administration of the tools following steps were used-

After selecting the divisions from each school, the detailed plan for administration was prepared. Since, whole syllabus of science subject was included in the Science Ability Tests, it was essential to administer the test just before the annual examination when whole content from the syllabus was covered by the teachers. Therefore, the tools were administered from third week of February 2003 to last week week of March 2003 in different 29 schools from Pune city. The tools were administrated on the students studying in standard IX during the academic year 2002-2003.

1. The researcher visited each school selected in the sample.
   Explained the purpose of his visit to the head of the school and asked the permission to talk with the concerned students.
2. The students were given the following instructions:
   i. They are having one test after 7 days.
ii. The marks of the test are not going to affect their school results.

iii. They have to prepare for the whole syllabus of Science.

iv. The answers are to be written on the booklets.

3. In all schools the researcher himself administered the test.

4. Researcher visited same class twice. In first visit, he administered the SES Scale and SAT- I while in second visit he administered the SIT and SAT- II to the same students. There was a gap of at least one day between these two visits.

5. After the administration, of the test the researcher collected the answer sheets.

Initially the tools were administered on 1523 students but after collection of the data, the sample was reduced to 1454 due to various reasons, mainly the less number of the students from High socio-economic group. Therefore the researcher decided to omit the students from High Socio-Economic group.

The researcher himself assessed all the answer sheets and scored them. After assessment of the answer sheets further statistical treatment was done.

4.7 Statistical Techniques

The data collected by the tools was analyzed with the help of the various statistical techniques. To study the interest and ability in science, mean and standard deviation has been used. To test the significant difference between mean scores of different variables, t-test has been used. To study the relation between students' interest and ability in science Pearson's Product Moment Correlation (r) has been used. The collected data also represented graphically with the help of the bar graphs.

After the data collection, the analysis and interpretation of the data was carried out. This is discussed thoroughly in next chapter.
REFERENCES


