CHAPTER III
RESEARCH METHODOLOGY

INTRODUCTION

Research is basic to every field of knowledge. It is a tool of tremendous importance for verifying, testing and validating current and old knowledge and also a potent means of creating new knowledge. After selecting the area of research, defining the problem, reviewing the research problems and stating the objectives and hypotheses the researcher finalizes the research methodology.

The role of research in an era of knowledge explosion is of paramount importance. Research not only helps in generating new information and knowledge but also enables practitioners to walk the fine line between openness to new ideas and healthy scepticism.

The term ‘Research’ consists of two words:

Research = Re + Search

‘Re’ means again and again and ‘Search’ means to find out something.

Therefore, “research means to observe the phenomena again and again from different dimensions”. According to Rusk “Research is a point of view, an attitude of inquiry or a frame of mind. It asks questions which have hitherto not been asked, and it seeks to answer them by following a fairly definite procedure. It is not a mere theorising, but rather an attempt to elicit facts and to face them once they have been assembled”.

Research is not something that bolster up pre-conceived opinion, but it prepares the readiness to accept the conclusion even though it is very unwelcoming type. When research is successful it increases the scientific knowledge of the subject where the research is undertaken.

According to C.C. Crawford “Research is simply a systematic and refined technique of thinking, employing specialized tools, instruments, and procedures in order to obtain a more adequate
solution of a problem than would be possible under ordinary means.”. Any research activity starts with a problem, based on the problem data and facts are collected, then analysis is done critically and a conclusion is arrived on the basis of the actual evidence. Research is an original work and not anything personal. It arises because of the desire to know something rather than prove something. Research is a quantitative phenomenon and its central feature is to know not only what but also how much.

John W. Best thinks, “Research is considered to be the more formal, systematic, intensive process of carrying on the scientific methods of analysis. It involves a more systematic structure of investigation, usually resulting in some sort of formal record of procedures and a report of results or conclusions.”

There are two major paradigms of research in education:
1] The quantitative paradigm
2] The qualitative paradigm

“Quantitative research involves counting and measuring of events and performing the statistical analysis of a body of numerical data”. Quantitative paradigm is of the belief that there is some truth existing in the world which can be explained and measured scientifically. The measurement in quantitative paradigm are valid reliable and can be generalised.

“Qualitative research produces findings not arrived at by means of statistical procedures or other means of quantification”. Qualitative research tries to accurately decode, describe and interpret the phenomenon occurring in the social context. Quantitative researcher tries to predict, determine and generalise the finding whereas qualitative researcher seek to illuminate understand the same situation.

The present research has used the quantitative paradigm of research design.
STATEMENT OF THE PROBLEM

“A Study of Environmental Awareness and Environmental Ethics among the Secondary and Higher secondary school students of Greater Mumbai.”

DEFINITION OF THE TERMS

Whenever research is undertaken, the key terms used in the study needs to be defined. This is done to give a concrete meaning to the variables and also to establish the references so that the can approach the problem. The conceptual definition is the actual dictionary meaning of the definition put forth by various educationists or psychologists. The operational definition, desired by the researcher from the conceptual definition stipulates the operation by which the term can be observed and measured.

In other words, the operational definition is the meaning adopted by the researcher to study the given variable.

Given below are the conceptual and operational definitions of the terms involved in the study:

Conceptual definitions:

Study : It means a detailed examination and analysis of a subject, phenomenon etc.

Environment :“It means the complex of physical, chemical and biological factors (as climate, soil and living things) that act upon an organism or an ecological community and ultimately determine its formal survival”.

Awareness : It means to have knowledge, information about a subject.

Ethics : It deals with what is good and bad and with normal duty and obligation

Secondary Students : It means students studying in secondary school

Higher Secondary Students : It means students studying in higher secondary school (i.e.) after standard X where students select area of their interest.
**Greater Mumbai**: The area which comprises of Mumbai city and Mumbai suburban but administrated by same Municipal administration or a city of west-central India on coastal Mumbai island and adjacent salsette island. It is India’s main port and commercial centre.

**Operational Definition:**

**Environmental Awareness**: Envision the increasing of awareness and understanding of the environment through education. Most of our population is not aware of our limited resources and how quickly they are being used up. Hence environmental awareness means to make every individual aware of the environment as a whole and its related problem.

**Environmental Ethics**: “Refers to the responsibility to understand the environmental consequences of our consumption, and need to recover our individual and social responsibility to conserve natural resources and protect the earth for future generations”.

**Secondary School Students**: Refers to male and female students studying in the secondary schools i.e. standard IX and X affiliated to the MSBSHSE and CBSE Board.

**Higher Secondary Students**: Refers to male and female students studying in the junior college i.e. standard XI and XII affiliated to the MSBSHSE.

**Greater Mumbai**: Refers to secondary school and higher secondary schools under western, central and harbour railway routes.

**AIMS OF THE STUDY**

The researcher after identifying and defining the problem, arranges his ideas or plan of action in a systematic manner, so as to reorganize the path in which the study is directed. For this, the researcher needs to pen down the aims of the study undertaken.

The aims of the study are as follows:

1) To Study the Awareness of Environment among the Secondary school students and Higher secondary school students.
2) To know what level of Environmental Ethics does the Secondary school students and Higher secondary school students possess.

OBJECTIVES OF THE STUDY

The aims of the study denote the general direction in which the study is expected to progress. The researcher therefore needs to clearly state the objectives, which tells the researcher what he is expected to do, with the view of achieving the stated aims of the study.

The study seeks to achieve the following objectives:

1. To study the awareness of causes of environmental pollution among the Secondary school students on the basis of
   a. Gender
   b. Education at different boards

2. To study the awareness of causes of environmental pollution among the Higher Secondary students on the basis of:
   a. Gender
   b. Discipline [Arts, Commerce & Science]

3. To compare the awareness of causes of environmental pollution among the Secondary school students and Higher Secondary school students.

4. To study the awareness of conservation of environment among the Secondary school students on the basis of:
   a. Gender
   b. Education to different boards

5. To study the awareness of conservation of environment among the Higher secondary school students on the basis of:
   a. Gender
   b. Discipline [Arts, Commerce & Science]

6. To compare the awareness of conservation of environment among the Secondary School students and Higher Secondary school students.

7. To study the environmental awareness among the Secondary school students on the basis of
   a. Gender
b. Education at different boards

8. To study the environmental awareness among the Higher Secondary school students on the basis of:
   a. Gender
   b. Discipline [Arts, Commerce & Science]

9. To compare the environmental awareness of Secondary school students and Higher Secondary school students.

10. To study the level of environmental ethics of Secondary school students on the basis of:
    a. Gender
    b. Education at different boards

11. To study the level of environmental ethics of Higher Secondary school students on the basis of:
    a. Gender
    b. Discipline [Arts, Commerce & Science]

12. To compare the level of environmental ethics among Secondary school students and Higher Secondary school students.

13. To study the correlation between environmental awareness and environmental ethics among the Secondary school students on basis of:
    a. Gender
    b. Education at different boards

14. To compare the correlation between environmental awareness and environmental ethics among the Higher Secondary school students on basis of:
    a. Gender
    b. Discipline [Arts, Commerce & Science]
HYPOTHESES OF THE STUDY

In order to conduct the study the researcher has formulated null hypothesis because such hypothesis more readily defined the mathematical model to be utilized in the statistical tests of the hypotheses and makes the study objective. The null hypotheses framed are as follows:

1. There is no significant difference in the awareness of causes of environmental pollution among the Secondary school students on the basis of:
   a. Gender
   b. Education at different boards
2. There is no significant difference in the awareness of causes of environmental pollution among the Higher secondary students on the basis of:
   a. Gender
   b. Discipline [Arts, Commerce & Science]
3. There is no significant difference in the comparison of the awareness of causes of environmental pollution among the Secondary school students and Higher Secondary school students.
4. These is no significant difference in study of the awareness of conservation of environment among the Secondary school students on the basis of:
   a. Gender
   b. Education at different boards
5. There is no significant difference in the study of the awareness of conservation of environment among the Higher Secondary school students on the basis of:
   a. Gender
   b. Discipline [Arts, Commerce & Science]
6. There is no significant difference in the comparison of the awareness of conservation on environment among the Secondary school students and Higher Secondary school students.
7. There is no significant difference in the study of the environmental awareness among the Secondary school students on the basis of:
   a. Gender
   b. Education at different boards.
8. There is no significant difference in the study of the environmental awareness among the Higher Secondary school students on the basis of:
   a. Gender
   b. Discipline [Arts, Commerce &Science]

9. There is no significant difference in the comparison of the environmental awareness of Secondary school students and Higher Secondary school students.

10. There is no significant difference in the study of the level of environmental ethics of Secondary school students on the basis of:
    a. Gender
    b. Education at different boards

11. There is no significant difference in the study of the level of environmental ethics of Higher secondary school students on the basis of:
    a. Gender
    b. Discipline

12. There is no significant difference in the comparison of the level of environmental ethics among Secondary school students and Higher secondary school students.

13. There is no significant correlation between environmental awareness and environmental ethics among the Secondary school students on the basis of:
    a. Gender
    b. Education at different boards

14. There is no significant correlation between environmental awareness and environmental ethics among Higher Secondary school students on the basis of:
    a. Gender
    b. Discipline [Arts, Commerce &Science]

VARIABLES OF THE STUDY

“Variables are properties or characteristics of some event, object, or person that can take on different values or amounts. Variables are things that we measure, control, or manipulate in research”. The difference lies in the role they play and in the type of measures applied to them.
“Dependent variables are the outcome variables and are the variables for which we calculate statistics. The variable which changes on account of independent variable is known as dependent variable”.

“Independent variables are variables which are manipulated or controlled or changed”. The classifying or attributes independent variables are the variables which cannot be manipulated but the sample can be classified accordingly.

Mostly experimental research use the term dependent and independent variable. Here, some variables are manipulated hence they are independent from features, intention, initial reaction patterns etc. some variables are dependent on the experimental condition.

The dependent variables of the study are:
- Awareness of environment
- Level of environmental ethics.

The demographic for classification of the variables of the study are:
- Gender
- Education at different boards
- Discipline (arts, science and commerce).

DELIMITATIONS AND SCOPE OF THE STUDY

Defining the scope of the study and demarcating its frontiers ensures greater specificity and precision besides keeping at bay unwanted inferences. The scope of the study elaborates what the investigator actually attempts to study. Delimitations draw the boundaries for the study.

The present study, studies the awareness of the environment of the Secondary school students and Higher secondary school students. It also studies the level of environmental ethics of Secondary school students and Higher secondary school students.
It studies the awareness as under:

a. Cause of pollution
b. Conservation of forest, soil, energy, human health, air, wildlife and animal husbandry.

It studies the ethics towards environment.

It studies the awareness of environment and level of environmental ethics of Secondary school students with respect to:

a. Gender
b. Education at different boards.

It studies the awareness of environment and level of environmental ethics of HSC students with respect to:

a. Gender
b. Discipline [Arts, Science & Commerce].

It covers the secondary school students of English medium schools following curriculum prescribed by MSBSHSE and CBSE Board.

It covers the Higher Secondary school students from different disciplines mainly Arts, Commerce and Science, following curriculum prescribed by MSBSHSE.

It covers the geographical area of Greater Mumbai under western, central and harbour railway routes.

The present study does not cover the Environmental Awareness and Environmental Ethics among Administrators, Institutions, Teachers Teaching Primary, Pre-Primary, Secondary, Higher Secondary and University Levels.

Hindi, Marathi, Guajarati, Urdu, Kannada or other medium are not covered.

ICSE, IGCSE, IB and other boards are not covered.

The study does not cover geographical areas of Thane.
TYPES OF RESEARCH DESIGN

All research involves careful observation, description and the analysis of what happens under certain circumstances.

There are three types of educational research methods:

1. Historical Research

“Historical research is the systematic and objective location, evaluation and synthesis of evidence in order to establish facts and draw conclusions about past events”. Historical research is an enquiry of the past to represent a faithful enquiry of the past. In historical research the researcher studies documents and other sources of past evidence in order to have a better understanding of the practices, policies, problems and institutions of the present. In short it is a study of the past to link it to the present.

2. Experimental Research

In an experimental research study, the researcher manipulates certain stimuli, environmental conditions and treatments and observes how such manipulations effect the subject. Manipulation here is systematic and deliberate. The researchers must be aware of the other factors which affects the subject and must change or control them so that there is logical association between manipulated factors and observed effects on the subject.

For hypothesis testing experimental research is one of the methods as hypothesis is the heart of any experimental research. After a problem is defined by the experimenter he has to frame the hypothesis, then he has to test the hypothesis to confirm or disconfirm it.

Experimental research can be used in laboratory as well as non-laboratorial settings such as classroom. To predict the event in experimental setting is the main purpose of experimental research. The ultimate purpose of experimental research is to generalise the relationship so that it can be applied to non-laboratorial settings.
The type of experimental research design which is very popular in experimental research are:

1. **Pre-experimental designs** – They donot provide any control over extraneous variable hence least effective.

There are two types of pre-experimental designs:
- a. The one group pre-test post-test design
- b. The two groups static design

2. **True experimental designs** – in order to control the effect of variables such as history, testing, statistical regression, maturation and mortality it employs randomisation.

The different types of true experimental designs are:
- a. Two groups, randomized subjects, post-test only design.
- b. Two groups, randomized matched subject, post-test only design.
- c. Two groups randomized subjects, pre-test post-test design
- d. The Solomon three groups design
- e. The Solomon four group design

3. **Quasi-experimental designs** is used only when randomization is not possible and it provides less degree of control.

The different types of Quasi experimental designs are:
- a. The non-equivalent groups design
- b. The counterbalanced design

4. **Factorial designs**- if more than one independent variables can be manipulated simultaneously then it is known as factorial design. With the help of factorial design independent and interaction effects of two or more than two factors can be studied.“Experiments in which the treatments are combinations of levels of two or more factors are said to be factorial”. If we study all possible combinations then it is known as complete factorial experiment. We call it 2x2 factorial design
when two independent factors have two levels each. We call it as 2x2x2 factorial design when three independent factors have two levels each. We may also have 2x3, 3x3, 3x4, 3x3x3, 2x2x2x2, etc.

3. Descriptive Research

“The descriptive research attempts to describe, explain and interpret conditions of the present i.e. what is”. To observe a phenomenon that is occurring at a specific place and time is the objective of descriptive research. Descriptive research consists of conditions, structures, differences or relationships, practices that exist and trends that are evident.

Descriptive studies in education can be classified into three broad categories:

a. Survey studies
b. Developmental studies
c. Inter relational studies

Interrelationship studies attempt to trace the relationship between various variables of the study. Inter relationship studies include:

a. Case studies
b. Causal Comparative studies
c. Co-relational studies
d. Cross Cultural Comparative studies

METHOD OF THE STUDY

The selection of methodology of the study depends upon the aims of the study. The present study has two broad aims:

1. To study the awareness of Environment among the Secondary school students and Higher Secondary school students.
2. To Study the level of Environmental Ethics among and the Secondary school students and Higher Secondary school students.
In keeping with the aims, the researcher adopted the **Descriptive Correlational Method**.

The researcher has used the quantitative paradigm to test the hypotheses statistically in order to study the environmental awareness and environmental ethics practices among and the Secondary school students and higher secondary school students of Greater Mumbai in relation to their gender, education at different boards and discipline (arts, science and commerce). The descriptive research method included under the quantitative paradigm has been used in the present research.

The descriptive survey method of the correlational type has been adopted in the present research.

“Correlational research describes what exists at the moment (conditions, practices, processes, structures etc.) and is therefore, classified as a type of descriptive method”.

After collecting data in order to find out whether and what extent a relationship exist between two or more quantifiable variables correlation research is used. Numerical data is used in correlation research. Coefficient of correlation is the degree of relationship that exists. If relationship exists then the score on one variable is associated with or varies with the score of another variable.

In the present study, this method has been used to ascertain the relation between environmental awareness and environment ethics among the Secondary school students on the basis of gender and education at different boards. It also establishes the relationship between environmental awareness and environmental ethics among Higher Secondary school students on the basis of gender and discipline (arts, science and commerce). The study may be termed as synchronic study because at one point of time the data is collected.
SAMPLING TECHNIQUES

Once the methodology of the study is defined the next step is sampling. Sampling is used on a small proportion of population to draw valid inferences after carefully observing the variable.

“A sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher would adopt in selecting items for the sample. Sampling design is determined before data are collected”.

In order that the researcher generalised the result sampling process is used in which a unit is selected from a population of interest so that by studying such sample the result can be related to the population from where it was chosen. In any research, ideally it is essential to cover individuals, institutions or inanimate units in the study to draw generalizations concerning educational phenomena under consideration. However, it is impractical and extremely difficult to involve each and every individual or institution in the study. Under these circumstances the results are generalized back to the population from which it was chosen. Ideally, in any research, it is essential to cover individuals, institutions or inanimate units, in order to draw generalizations concerning finite subset of individuals in a population that has been studied. This finite subset is called a sample. The size of the sample is referred to as the number of individuals in a sample.

Based on two factors viz. (1) the representation basis and (2) the element selection technique on the representation basis there are different types of sampling techniques.

Two types of samplings are
a. Probability Sampling
b. Non-probability Sampling.

Probability Sampling:
When each member of the population has an equal chance of being selected, then it is known as probability sampling. In probability sampling randomness is the element of control.
Various types of probability sampling are:

a. Simple random sampling
b. Systematic sampling
c. Stratified sampling
d. Cluster sampling
e. Multi stage sampling

a) Simple Random Sampling: When all the members have a same chance of being selected, then it is known as simple random sampling. It provides unbiased cross selection of the population.

b) Systematic Sampling: When each member comes after an equal interval, then it is known as systematic sampling. Randomly the starting point for the selection is chosen.

c) Stratified Sampling: Here the population is divided into smaller similar groups by some characteristics. From each randomly members are selected.

a) Cluster Sampling: Here the researcher selects at random the sampling units and then does complete observation of all units. It is also known as area sampling as the selection is done on the basis of place, employment or residence.

e) Multistage Sampling: Here the sample is selected at random in different stages.

Non Probability Sampling

Here the member of population selected is unknown. In non-probability sampling randomness relies on personal judgement.

Types of Non Probability Sampling

a) Purposive Sampling
b) Convenience Sampling
c) Quota Sampling
d) Snowball Sampling

**a) Purposive Sampling:**

Here a typical group is selected by the researcher which represents the larger population and then the data is collected from the group.

**b) Convenience Sampling:**

This method consists of obtaining units which are more conveniently available. In convenient sampling the units are selected in such a way that the cases are already available. Based on the sample size available the data is collected easily by the researcher.

**b) Quota Sampling:**

Here the sample is collected from a specified sub-group of the population. The researcher first identifies the category which is important then determines sample size and then selects individual on availability basis.

**c) Snowball Sampling:**

Here the researcher first identifies and selects sample which satisfy his or her study. After collection of data the researcher also collects data from other individual who would also meet the criteria and represent the population.

The researcher has adopted Stratified Random Probability Sampling for the purpose of the present study. The sampling process involved three stages:

1*st* stage – Three strata were made among the Secondary schools and Higher secondary schools of Greater Mumbai viz. Secondary schools and Higher secondary schools in the central route, western route and harbour route.

2*nd* stage - From each stratum Secondary schools attached to SSC board and CBSC board and Higher secondary schools attached to MSBSHSE were chosen.
3rd stage – Male and female sample were randomly chosen.

**Description of the Population**

“Population refers to the totality of objects or individuals regarding which inferences are to be made in a sampling study”.

For the purpose of the present study the population includes Secondary school students of Greater Mumbai attached to State Board and CBSC Board and Higher secondary students of Greater Mumbai from Arts, Science and Commerce discipline attached to MSBSHSE and where English is the medium of instruction.

**The Sample – Its nature and Size**

“A sample is a subset of a population to which the researcher intends to generalize the results.”

According to Best and Kahn, “The ideal sample is large enough to serve as an adequate representation of the population about which the researcher wishes to generalize and small enough to be selected economically – in terms of subject availability, expense in both time and money and complexity of data analysis.”

For the present study data was collected from 267 Secondary school students from 10 English medium schools attached to State Board and 275 Secondary school students of 8 English medium schools attached to CBSC Board and 827 Higher Secondary school students of (arts, commerce and science discipline) 15 Junior Colleges attached to MSBSHSE.

The list of Secondary schools (SSC board) from where data were collected is appended in Appendix A.

The list of Secondary schools (CBSE board) from where data were collected is appended in Appendix B.

The list of Higher Secondary schools (State Board) from where data were collected is appended in Appendix C.
The following table depicts the distribution of the sample on basis of gender

Table 3.1
Gender wise distribution of the Sample

<table>
<thead>
<tr>
<th>Gender</th>
<th>Sec school students</th>
<th>Higher sec. school student</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>313</td>
<td>404</td>
<td>717</td>
<td>52.37</td>
</tr>
<tr>
<td>Male</td>
<td>229</td>
<td>423</td>
<td>652</td>
<td>47.63</td>
</tr>
<tr>
<td>Total</td>
<td>542</td>
<td>827</td>
<td>1369</td>
<td>100</td>
</tr>
</tbody>
</table>
The figure 3.1 shows the gender wise distribution for the sample

Graphical representation of the Gender wise distribution of the Sample

Fig.3.1
The following table shows the distribution of the secondary school students sample on the basis of type of board

Table 3.2

<table>
<thead>
<tr>
<th>Type of Board</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Board</td>
<td>267</td>
<td>49.26</td>
</tr>
<tr>
<td>CBSE Board</td>
<td>275</td>
<td>50.74</td>
</tr>
<tr>
<td>Total</td>
<td>542</td>
<td>100</td>
</tr>
</tbody>
</table>
Figure 3.2 helps us to visualize the distribution of secondary school students sample on the basis of type of board.

Graphical Representation of Board wise distribution of the Sample

![State board v/s CBSE board distribution of sample](image)

*Fig 3.2*
The following table depicts the distribution of the sample on the basis of discipline of Higher secondary school students

Table 3.3
Sample Distribution on the basis of discipline of Higher secondary school students

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>240</td>
<td>29.02</td>
</tr>
<tr>
<td>Commerce</td>
<td>308</td>
<td>37.24</td>
</tr>
<tr>
<td>Science</td>
<td>279</td>
<td>33.74</td>
</tr>
<tr>
<td>Total</td>
<td>827</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 3.3 helps us to visualize the distribution of the sample on the basis discipline of Higher secondary school students.

Graphical Representation of the distribution of sample, discipline wise

![Distribution of Sample - Discipline wise](image)

Fig.3.3
THE TOOLS OF RESEARCH

We need some type of instrument to gather new facts in each and every type of research. The instrument used for collecting data is called tools. Selecting the right tool is very important for research work. Different types of tools are available for collecting information.

The major tools of research in education can be classified broadly into the following categories.

A. Inquiry forms
   - Score-card
   - Questionnaire
   - Opinionnaire
   - Rating Scale
   - Checklist
   - Schedule
   - Attitude Scale

B. Interview

C. Observation

D. Psychological Tests
   - Aptitude Test
   - Achievement Test
   - Interest inventory
   - Intelligence Test
   - Personality measures etc.

E. Sociometry

TOOLS USED IN THE PRESENT STUDY

The data for the present study needed to be collected from the secondary school students and higher secondary school students. Hence the following specific instruments have been used for the purpose
A. Researcher made Tools

Personal Data Sheet for Secondary School students and Higher Secondary School students. A copy of the tool is appended in Appendix D.

B. Readymade Tool

In order to measure the Environmental awareness among the Secondary and Higher secondary students of greater Mumbai “Environmental awareness ability measure tool prepared by Dr. Praveen Kumar Jha (1998)” was used with change in Ranking scale [such as Strongly agree (SA), Agree (A), Undecided (U), Disagree(DA) and Strongly Disagree (SDA)].

The items in the questionnaire have also been bifurcated into two heads as cause of pollution and conservation of pollution for convenience of study.

The final form of the tool for causes of Environmental pollution contains 27 items, 7 statements are negatively worded, 20 statements are positively worded.

Each item is to be rated on a five point scale of SA, A, U, DA and SDA. The scoring pattern is given as under:

\[
\begin{array}{|c|c|c|}
\hline
\text{Response category} & \text{Scale value for positive statements} & \text{Scale value for negative statements} \\
\hline
\text{SA} & 5 & 1 \\
\text{A} & 4 & 2 \\
\text{U} & 3 & 3 \\
\text{DA} & 2 & 4 \\
\text{SDA} & 1 & 5 \\
\hline
\end{array}
\]
The scoring is done in such a way that higher the score, more is the ACEP. The minimum obtainable score in this scale is 27 and the maximum is 135. A copy of the tool is appended in Appendix E.

The final form of the tool for conservation of Environment contains 25 items. one statement is negatively worded, 24 statements are positively worded. Each item is to be rated on a five point scale Strongly agree (SA), Agree (A), Undecided (U), Disagree (DA) and Strongly Disagree (SDA).

The scoring pattern is given in the following table:

### Table 3.5
**Response category and scale value for ACE**

<table>
<thead>
<tr>
<th>Response category</th>
<th>Scale value for positive statements</th>
<th>Scale value for negative statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree (SA)</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Agree (A)</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Undecided (U)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Disagree(DA)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Strongly Disagree (SDA)</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

The scoring is done in such a way that higher the score more is ACE. The minimum obtainable score in this scale is 25 and the maximum is 125. A copy of the tool is appended in Appendix F.
To measure the Environmental ethics among the Secondary and Higher secondary students of Greater Mumbai, Environment Ethics scale by Dr.(Mrs.) HaseenTaj (1981) was used with change in the Ranking scale. [such as SA, A, U, DA and SDA].

The final form of the tool contains 45 items. 37 statements are negatively worded, 8 statements are positively worded.

Each item is to be rated on a five point scale strongly agree (SA), Agree (A), Undecided (U), Disagree (DA) and Strongly Disagree (SDA).

The scoring pattern is given in the following table:

<table>
<thead>
<tr>
<th>Response category</th>
<th>Scale value for positive statements</th>
<th>Scale value for negative statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree (SA)</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Agree (A)</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Undecided (U)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Disagree(DA)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Strongly Disagree (SDA)</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

The scoring is done in such a way that higher the score more is LEE. The minimum obtainable score in this scale is 45 and the maximum is 225.
A copy of the tool is appended in Appendix G.

**Validity of Tools**

According to Best and Kahn, “Validity of a tool refers to the extent to which a tool measures what it claims to measure.”

The tool can be validated by the following methods:

1. **Face Validity**
2. **Content Validity**
3. **Criterion Validity**
4. **Construct Validity**

**Face Validity:** A test has face validity when the items look like they measure what the test is supposed to measure. It refers, not to what the tool necessarily measures, but to what it appears to measure. Does the tool ‘look’ valid? Does it seem to be relevant to its objectives when viewed by the subjects who take it, the researcher using it, or anyone else who might judge it? Face validity is determined by a somewhat superficial examination of the tool by the subjects/experts/respondents and only the obvious relevance is considered.

**Content Validity:** According to Anastasia “content validity involves essentially the systematic examination of the text content to determine whether it covers a representative sample of the behaviour domain to be measured”. Content validity refers to how our tool represents the universe. It is used for selection of items in research tools. The validation of the content is satisfactory when the sampling is wide and judicious.

**Criterion Validity:** The other name is empirical validity.

Criterion related validity is of two forms:

1. **Predictive Validity:** “It refers to how well the scores obtained on the tool predict future criterion behaviour”.
2. Concurrent Validity: “It refers to how well the scores obtained on the tool are correlated with present criterion behaviour”.

**Construct Validity**: It gives the extent to which the tool measures a theoretical construct. It also shows us how well our tool measures hypothesised traits.

To ascertain the validity, the researcher gave tool to experts in the field of education, for their expert opinion. The questionnaire was modified by the researcher by keeping intact the opinion and suggestions given by the experts.

**Reliability of Tools**

According to Best and Kahn, “Reliability of a tool refers to the consistency with which a tool measures what it proposes to measure.”

The reliability of a tool can be determined through the following methods.

a. Internal-consistency Reliability
b. Test-retest Reliability
c. Alternate/ Parallel Forms Reliability
d. Split-Half Reliability

**Internal Consistency Reliability**: This is used to ascertain the internal consistency of the test. There are many methods of establishing internal consistency such as the split-half method, Cronbach’s alpha, Spearman Brown’s formula, Kuder Richardson Co-efficient and Hoyt's ANOVA.

**Test-Retest Reliability**: This reliability is expressed in terms of co-efficient of stability over time. Hence scores on the first administration of a test are correlated with the scores on the second administration after a gap of about four weeks.

**Alternate or Parallel forms Reliability**: This determines the reliability of the test with other similar test of known reliabilities. Since all types of reliability are concerned with the degree of
consistency or agreement between two independently derived sets of score, they all can be expressed in terms of co-efficient of correlation.

The monograph on test and item analysis for universities recommends the value of 0.65 for reliability of group tests as acceptable. For the purpose of the present study, the internal consistency reliability and the test-retest reliability of each tool was determined.

**Split-Half Reliability:** In this method, the same test is conducted once on sample. The individual score is obtained in two parts i.e. odd numbers and even numbers. The scoring is done separately for both the parts and then the coefficient of correlation is calculated in two halves. The reliability of half test indicates the coefficient of correlation. By using Spearman-Brown Prophecy formula, the self-correlation coefficient of the whole test is obtained.

In order to ascertain the reliability for the tool, spilt-half reliability co-efficient was computed. Reliability for environmental awareness was determined by split-half method. Reliability was found to be 0.78. Reliability for EES was computed by split-half (odd-even and 1st half – 2nd half) method. The reliability for odd-even was found to be 0.86 and 1st half – 2nd half method was found to be 0.81.

**PROCEDURE OF THE STUDY**

This stage involves the collection of information required for the purpose of the study. Data collection is the actual process of collecting information that the researcher wishes to study, analyse and interpret. Having prepared the tools the next step was to seek the permission of the school authorities for the collection of data.

The researcher enjoyed the process of data collection and the opportunities to meet many people, visit new places and thus get insight into the environment of a variety of institutions. The support, the response and interest shown by some of the Principals were overwhelming and encouraging and kept the researcher going.
In order to ensure smooth and problem free data collection the researcher first visited the Secondary schools and Higher secondary schools and obtained permission from the Principals. Only after the researcher ensured the Principals that the identity of the respondents will be kept confidential and the data collected will be used for research purpose the researcher was given permission for data collection. On the appointed day and time the researcher met the students and gave a brief idea of the study and motivated the students to honestly attempt to respond to the tool. The instructions were also given for filling each tool. The students showed lot of interest in the study and filled the tools with lot of enthusiasm.

The researcher took nine months to complete the data collection process. The students required approximately one hour to answer the tools.

The Secondary school students had returned all the tools completely filled up, but the Higher secondary school students returned some tools unfilled or partially filled. Out of the 1424 tools distributed 55 tools were returned unfilled or partially filled. Thus the wastage of tool amounted to 55.

These instances are a part of any research and the researcher was determined not to be put off by such hurdles.

The permission letter is appended in Appendix H.

**COLLECTION OF DATA**

For the present study data was collected from 267 Secondary school students from 10 English medium schools attached to State Board and 275 Secondary school students of 8 English medium schools attached to CBSC Board and 827 Higher Secondary school students of (arts, commerce and science discipline) 15 Junior Colleges attached to MSBSHSE.

**Quantification of Data**

After collection of data, the responses of students were quantified by assigning scale values to the items and the scores were so organized that the process of tabulation becomes easier.
Tabulation of Data

Data collected from tests, experiments or survey has little meaning until they have been arranged or classified in some systematic way. Tabulation refers to the recording of classified scores. The method of tabulation depends upon the aims and objectives of the study.

ANALYSIS OF DATA

Analysis of data is an important part of research design. It includes the processing of the data that is collected for the study. At this stage, the tabulated data are scientifically and systematically studied in order to determine the underlying, inherent facts or relationships. During this process, the existing complex factors are broken down into smaller, simpler parts. These parts are then put together in new arrangements so as to synthesize and interpret them.

Statistical Techniques of Data Analysis

The contribution of the statistical techniques is considerably high in the process of analysing of the data. In the present study, two types of analyses are adopted.

1. Analysis by Descriptive method
2. Analysis by Inferential method

Descriptive Analysis

This type of analysis is necessary to establish normality of the distribution of the data so that appropriate techniques can be employed for testing the null hypotheses. Descriptive analysis is useful in studying the characteristics of a particular group of individuals. The generalizations made through the descriptive analysis of one group of individuals cannot be extended beyond the group.

The statistical techniques used by the investigator for the descriptive analysis of data are as follows:

a. **Measures of Central Tendency:** These include the mean, the median and the mode.
b. **Measures of Variability:** These include the standard deviation, skewness and kurtosis.

c. **Graphical Method:** This includes bar diagrams.

**Inferential Analysis**

This is also known as the testing of hypotheses. It involves the use of statistical techniques in order to arrive at generalizations and conclusions about the nature of data and the relationship between various variables of the study. Generalizations arrived at through inferential analysis can be extended to infer population parameters.

The present study involves the following statistical techniques for the testing of null hypotheses:

a. **t-test:** This has been used to ascertain the significance of difference of mean of awareness of causes of pollution, awareness of conservation of environment, awareness of environment and environmental ethics among the Secondary and Higher secondary school students.

b. **Analysis of Variance test [ANOVA]**

A composite procedure for testing simultaneously the difference between several sample means is known as the analysis of variance. It helps us to know whether any of the differences between the means of the given samples are significant. If the answer is ‘yes’, we examine pairs with the help of the ‘t’ test to see just where the significant difference lies.

The researcher has used this technique to ascertain the significance of difference of mean of the awareness of environment and environmental ethics among Higher secondary school students.

c. **Pearson’s Correlation Coefficient**

This was used to ascertain the relationship of Secondary school students awareness of environment and environmental ethics with

1) Gender
2) Type of board

and Higher secondary school students awareness of environment and environmental ethics with
CONCLUSION
Research is basic to every field of knowledge. “Research means to observe the phenomena again and again from different direction”. Educational research can be classified as historical research, experimental research and descriptive research. The aim of this study is to study the awareness of environment among the secondary and higher secondary school students and to study the level of Environmental Ethics among the Secondary and Higher secondary students. Data for the study was collected from 267 secondary school students attached to Maharashtra state board, 275 secondary school students from CBSE board and 827 higher secondary school students from junior college belonging to Arts, Commerce and Science discipline attached to Maharashtra state board. The dependent variables of the study are awareness of environment and level of environmental ethics. Based on the aim of the study, objectives and hypothesis were formulated. The data collected were analysed by descriptive and inferential method, the statistical techniques used for descriptive analysis were measure of central tendency, measure of variability and graphical method. For testing null hypothesis, analysis of variance test, t-test and Pearson’s correlation coefficient where the statistical techniques employed.