Chapter - 3
Design and Methodology
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Research is a systematic and objective attempt to provide answers to certain question. The purpose of research is to discover and develop an organized body of knowledge and it is characterized by systematic objective and logical procedures. It is systematic because it involves certain steps to be followed in a definite order. It is objective because the researcher tries to eliminate personal biases. And makes every possible effort to ensure objectivity in the method employed data collected and conclusions drawn. The researcher develops an objective and scientific design for the smooth conduct of his research. He also makes a logical examination of the procedures employed in conducting his research work so that he might be able to check the validity of the conclusions drawn. Along with the significance, reliance and research ability of the problem selected for investigation, the methodology followed is also equally important for determining the dependability, usefulness and generalize ability of the findings, in spite of appropriateness of the problem and tools selected, if the procedures and methodology are not up to the mark, it leads to misleading the results. That is why this aspect of the study is considered to be very important.
Thus, the success of a researcher lies in his choice of methodology to be used. Methodology includes all the plans, techniques and strategies followed in carrying out the research study. This chapter reports in detail the design of the present study including techniques of sample selection, development of research tools, and data collection and an analysis of these aspects of the investigation are given in the following sections:

3.1. Population and Sample:

3.2. Variables of the Problem:

3.3. Description of the Tool Used

3.3.1. Description of Developing Scale for Assessing Behavior Towards Environment (SABE)

3.3.1.a. Try out
3.3.1.b. Scoring
3.3.1.c. Reliability of the Scale (SABE)
3.3.1.d. Validity of SABE

3.3.2. Tool for Measuring Environmental Attitude (TEAS)

3.3.2.a. Brief Description of the TEAS:
3.3.2.b. Reliability of TEAS
3.3.2.c. Validity of TEAS
3.3.2.d. Administering the TEAS
3.4. Biographical Information Blank (BIB)

3.5. Data Collection

3.5.a. Collection of Data

3.5.b. Scoring

3.6. Administering the Environmental Awareness Programmes

3.7. Statistical Techniques Used

a. t-test

3.1. Population and Sample:

To study the whole population is rather difficult and impractical. A statistical process called sampling makes it possible to draw useful inference or generalization on the basis of careful study of observations or manipulation of variables, within a relatively small proportion of the population. The process of sampling generally refers to the method of selecting a small part or specimen of a large universe of subjects in order to study some quality or characteristic of the whole. So, sampling is one of the most fundamental aspects of the total methodology followed in a particular research study. It is an act of determining how many elements in a population are to be sampled, and how they are to be selected.
The Sample population of this study consists of 500 secondary school children of Aligarh city. Aligarh is a B grade city of Uttar Pradesh (UP). It has many other Secondary Schools.

A sample selected from Aligarh city may prove to be a representative one. A detailed description of the selected sample has been presented in the fourth coming table.

**Fig. 3.1**

**Showing Description of the Sample**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>N=500</td>
<td>230</td>
<td>270</td>
</tr>
<tr>
<td>Total Muslim</td>
<td>170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Non-Muslim</td>
<td>330</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High SES</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Middle SES</td>
<td>53</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Low SES</td>
<td>108</td>
<td>26</td>
<td>82</td>
</tr>
<tr>
<td>High SES</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Middle SES</td>
<td>53</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Low SES</td>
<td>108</td>
<td>26</td>
<td>82</td>
</tr>
<tr>
<td>High SES</td>
<td>12</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Middle SES</td>
<td>48</td>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>Low SES</td>
<td>56</td>
<td>26</td>
<td>30</td>
</tr>
</tbody>
</table>

**3.2. Variables of the Problem:**

The present problem has the following variables.

1. **Dependent variables** - Environmental awareness
2. **Independent variable** -
   (a) Environmental attitude
   (b) Environmental behaviour
3. Personal variable -
   (a) Religion
   (b) Gender
   (c) Socio-economic background

3.3. Description of the Tools Used:

The meaningfulness of results of any research work depends not only on method and procedure, data analysis or results interpretation but also on the appropriateness of the tools and measures employed in the study. They should be appropriate, reliable and valid as well as suitable for the age and ability levels of the sample involved in the researcher work.

For measuring environment behaviour of the students, in the present study; the researcher went though different standardized tools. There were various tools to measure environmental awareness and environmental education but no satisfactory tool was available to measure environmental behaviour. So the researcher herself developed a tool for measuring environmental awareness. The details of developing this tool are being given in the following pages:
3.3.1. Description of Developing Scale for Assessing Behaviour towards Environment (SABE)

The above mentioned tool (for measuring environmental behaviour of the students) has been developed on the basis of psychological test.

A psychological test is an instrument designed to describe and measure a sample of certain aspects of human behaviour. Tests may be used to compare the behaviour of two or more persons at a particular time, or one or more persons at different time. Psychological tests yield objective and standardized descriptions of behaviour, quantified by numerical scores. Under ideal conditions, achievement or aptitude tests measure the best performance of which individuals are capable. Under ideal conditions, inventories attempt to measure typical behaviour. Tests and inventories are used to describe status (or a prevailing condition at a particular time), to measure changes in status produced by modifying factors, or to predict future behaviour on the basis of present performance.

Although it would be inaccurate to claim that all standardized tests meet optimum standards of excellence, these instruments have been made as sound as possible in the light of the best methods that is
known by experts in test construction, administration, and interpretation.

**Collection and Writing of Items:**

Statements related to basic knowledge and understanding about the environment and its related problems were collected from various available sources, which included electronic and print media, books, and people etc. with the availability of these sources, various areas of scale for assessing behavior towards environment (SABE) which has been mentioned below were taken into account

1. Health and Hygiene
2. Pollution (Air, Water and Noise)
3. Tree plantation
4. Killing of Animals
5. Physical Environment
6. Conservation of natural resources
7. Social environment
8. National Integration
9. Population Explosion

It is important to decide about the total number of items for a test. The items included in a test should be large enough to provide an adequate sample of students' behavior across the content areas and across process objectives. On the other hand, the time available for testing is a practical factor that limits the number of items in a test that
there is enough time so that at least 80% of the student can attempt to answer every items.

3.3.1a. Try out

All these 34 statements covered under the 9 areas of environmental awareness were administered to a sample of 30 students which included boys, and girls of senior secondary classes. Students were asked to respond to each statement of the questionnaire according to their extent of agreement or disagreement using the words "always, seldom, never".

The problem of determining the amount of time in which the test is to be administered is ordinarily inseparable from that of determining the length in terms of number of items. Therefore a time limit of 20 minutes was given to the students so that they may complete all the items carefully.

3.3.1b. Scoring

Table 3.1
The Scoring of Responses Done

<table>
<thead>
<tr>
<th>Response</th>
<th>Positively Phrased Statements</th>
<th>Negatively Phrased Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Seldom</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>
Marks according to the positive and negative statements were given on all the 34 statements of all the 30 answer sheets.

3.3.1.c. Reliability of the Scale (SABE)

The test (including 34 statements) was divided into 2 parts for testing the reliability of the scale.

i. Test I having odd number items

ii. Test II having even number items

Reliability of the scale was measured by using the following formula of Pearson's product movement coefficient of correlation (PPMCC).

\[ N = 30 \]
\[ x = 727 \]
\[ x^2 = 18861 \]
\[ y = 791 \]
\[ y^2 = 21649 \]
\[ xy = 19998 \]

\[ r = \frac{N \sum XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\sum X^2 - (\Sigma X)^2} \sqrt{N\sum Y^2 - (\Sigma Y)^2}} \]

\[ r = \frac{30 \times 19998 - 727 \times 791}{\sqrt{30 \times 18861 - (727)^2} \sqrt{30 \times 21649 - (791)^2}} \]
Reliability of the half test was found to be \( r = 0.83 \) and with this value, reliability of the whole test was calculated by using the formula given below:

\[
R = \frac{2r}{1+r}
\]

The calculation value of reliability of the test, \( r = 0.94 \) assure that the test is free from technical defects and can be used for research purpose.

3.3.1.d. Validity of the SABE:

In general test is valid if it measures what it claims to measure. However validity may be defined in a number of ways.
Face validity refers not to what the test actually claim to measure, but to what it appear to measure superficially. Thus, face validity should not be taken in the technically sense, nor should it be regarded as a substitute for objectively determine validity. When a test item looks valid to the group of examines, the test is set to have face validity.

The scale was carefully examined and given to a group of experts. They were asked to give their judgment about the relevance, content and language of the statements. Thus, SABE contents validity was assured.

Finally after the initial try out, all 34 items were found relevant ad selected for preparing the final form of Environment Behaviour Assessment Scale.

A copy of SABE is being attached (Appendix-A)

Final form of Scale for Measuring Behaviour towards Environment (SABE). Showing Distribution of statements in each dimension and their respective polarity.
Table 3.2

Distribution of Statements in each Dimension and their Respective Polarity

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Dimension of SABE</th>
<th>No. of Item</th>
<th>Items of positive polarity</th>
<th>Items of negative polarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Health &amp; Hygiene</td>
<td>11</td>
<td>1, 17, 18, 19, 20, 21, 23, 24, 25</td>
<td>9, 22</td>
</tr>
<tr>
<td>2.</td>
<td>Pollution</td>
<td>2</td>
<td>13, 15</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Tree plantation</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Killing of Animals</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Physical Environment</td>
<td>4</td>
<td>2, 8, 16, 14</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Conservation of Natural Resources</td>
<td>8</td>
<td>11, 26, 27, 28, 29, 30, 32, 33</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Social Environment</td>
<td>4</td>
<td>3, 5, 31</td>
<td>6</td>
</tr>
<tr>
<td>8.</td>
<td>National Integration</td>
<td>2</td>
<td>4, 7</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Population Explosion</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

3.3.2. Tools for measuring Environmental Attitude:

Taj Environmental attitude scale (TEAS) for obtaining attitude towards environment, the investigator went through various test of environmental attitude. Finally the environment attitude scale prepared by Dr. Haseen Taj in 2001 has used by the investigator.
Unquestionably, as we move into the information centered upon 21st century, we must incorporate effective environment education program which build an appreciation of the protect, as well as of the specific heralds threatening the world. Students should not be told what to think in regard to these complex issues confronting us, but rather what to think about and how to think constructively and critically.

3.3.2.a. Brief Description of the TEAS:

Following the Likert’s method of summated rating procedure. TEAS was developed with 61 items consisting of six areas. The six areas within the scale are attitude towards:

1. Population explosion
2. Health and hygiene
3. Polluters
4. Wild life
5. Forests
6. Environmental concerns

Initially 94 items were pooled from varied sources convering the above mentioned six areas. After a thorough discussion with the subject experts (N=25) in the field 22 items were dropped and a few were modified. The selected 72 attitude statement (based on the 80 to 100% agreement by experts) were retained for inclusion in the preliminary form of the Taj Environment Attitude Scale (TEAS) for try out.
• Reliability of the test
• Validity of the test
• Administering the TEAS

3.3.2.b. Reliability of TEAS:

Reliability of the scale was estimated by two methods (a) split half (odd-even and 1st half-2nd half) and (2) test-retest reliability coefficient with a time gap of one month on a sample of 150.

3.3.2.c. Validity of TEAS:

Taj Environmental Attitude Scale (TEAS) possesses high content validity because the items at the first state for try-out of the scale were selected on the unanimous agreements (80 to 100%) of experts in the field regarding its content adequacy. The TEAS also appears to have the item validity. The methods of item selection after computing the 't' value for each item based on 27% upper and 27% lower scores support this supposition. In addition, the differences in the mean scores of adolescents, youth and adults, rural-urban, male-female, high-low SES and occupational status (service, business and professionals) were computed. The differences observed also support the adequacy of scale validity.
The concurrent validity of the scale was determined by administering a parallel scale developed by the researcher with the same number of items worded differently retaining the theme. The scale seems to possess the cross validity, since the sample used for establishing the reliability of the scale was other than the one, used for try-out of the scale. The index of reliability computed for the scale also reflects the intrinsic validity. Hence, the scale is said to be a valid tool for assessing the environmental attitude.

3.3.2.d. Administering the TEAS:

The investigator distributed the Environmental Attitude test booklet to the students and then explained the Environmental Attitude scale to the students. Along with the test booklet, students were also provided with marking booklets where they have to mark their respective choices. The investigator gave some examples and solved some questions in order to teach the students how to make their choice. Once the investigator was assured that the students are filling their choices correctly and have understood the whole process the investigator gave no further assistance. Also some problem occurred in the filling up of record forms correctly for the purpose of knowing the required information of each student. Hence the investigator herself
dictated each and every student how to fill up the record form and checked the filled information.

The researcher asked them to write the answers in the answer sheet provided to them.

Since mistakes were ought to occur in filling up the record forms, therefore the investigator checked herself that each person has written on his form his own solution to the first five problems. Once the person has grasped the nature of the initial problems, the researcher gave no further assistance in the method of reasoning but saw that each person recorded his own choices correctly. The total time taken for administration of the intelligence that was about 25 minutes.

The copy of the TEAS is being attached (Appendix-B)

3.4 Bibliography Information Blank (BIB):

BIB was prepared along with the SABE by the investigator to gather personal information about the subjects selected in the sample. The BIB included name, age, sex, academic stream and monthly income of the parent.

A copy of Biographical Information Blank which is in the Scale for Assessing Behaviour Towards Environment is being attached (Appendix-A)
3.5. Data Collection:

3.5.a. Collection of the Data

Collection of data is an important phase in any research work. Various difficulties are generally felt by the researcher while collecting data in the present study the data was to be collected from the secondary school of Aligarh city only. The investigator visited different secondary schools of Aligarh city by the permission of their principals, and collected data from X & XI classes of all private and government school.

In one period the researcher first distributed the SABE along with the answer sheets and the pupils were asked to fill the Biographical Information Blank also attached with the questionnaire. After 25 minutes the researcher collected back the answer sheet of SABE and then distributed the TEAS test to same group. The researcher gave all the necessary instructions regarding the test. After 45 minutes answer sheets were taken back from the respective group of students.

The first phase of entire data collection was completed between 1 April to and 15 May 2007 and second phase of data collection for post test was completed in December 2007 January, 2008.
3.5.b. Scoring

After collecting the data, a detailed scoring sheet was prepared for the assessment of Environmental behaviour student. As mentioned earlier too, the marks were given according to the rules described for both positive and negative statement. Total marks were written on each answer sheet.

Scoring on Taj Environmental Attitude scale was done by using the scoring key of TEAS.

A scoring key was provided with the TEAS manual which was used for doing the scoring of the Taj Environmental Attitude test. Each item alternative is assigned a weightage ranging from 4 (strong agree) to (strongly disagree) for favorable items. In case of unfavorable items the scoring is reserved i.e. from 1 (strongly agree) to 4 (strongly disagree). The attitude score of an individual is the sum total of item scores on all the six areas. The range of scores from 61 to 244 with the higher score indicating the more favorable attitude towards environment and vice-versa.

The investigator checked the answer sheet of all the 496 respondents, and then the marks of each subjects were summed up and written on the sheet.
3.6. Administering the Environmental Awareness Programme:

Investigator selects few school of Aligarh as a sample comes under government and private organization by simple random technique. The collection of data is conducted in two phases i.e. pre-test and post test, investigator selects the standard IX and X for administration a question.

The investigator went to different government and private schools for collecting data for her research work.

The investigator selected randomly 11 schools of the city but got the permission from only the principals of 5 schools.

Table of Schools

1. Our Lady Fatima
2. Aligarh Public School
3. Ashiya Tareen Public School
4. Brilliant Public School
5. USSV Senior Secondary School

After taking the permission from the principals of the school, the investigator distributed her questionnaire to the students of IX and X standard of those schools selected by her.

After collecting the data, the investigator implemented some programs on the students related to environmental awareness for her
research work. The investigator took the permission of the principals of respective schools for collecting the required data from the students. Therefore, she got the permission to do the demonstration and research work for the students about the environment. Hence, she was allotted a total of 6 periods for carrying on her research work.

In this permitted time limit of 6 periods to the investigator, she first of all gave the information related to environment to the students. For this purpose she used various charts, stories, audio visuals, etc. to demonstrate the information she was giving and asked related questions to the students in order to bring out interest of students and to know how much the students have learned from the demonstration.

The demonstration conducted in all schools took 2 months to complete. After that the investigator involved the students in various activities like drawing competition, easy writing etc. so that the environmental awareness in students should enhance.

After the 6 months of pre-test the investigator took the post test on the same samples on which pre-test was taken and programmes were implemented.

The investigator was involved in administering pre-test, environmental awareness programme, and post-test in between the period from April 2007 to January 2008. The main reason for this time
period taken by the investigator was that she wanted to do all the work related to her research within one session with the same students in order to maintain accuracy and internal validity. This helped her to get the same samples for post test on which she previously applied the pre-test.

3.7. Statistical Techniques Used:

The raw scores as obtained directly after scoring the test booklets constitute simply a long list of numbers without any organization or order. The inspection of these raw scores does not provide any kind of director regarding conclusions to be drawn unless the scores are organized. Therefore in order to make meaningful interpretation and draw conclusions, it is necessary to re-organize and summarize raw scores in meaningful way, so that the summarized data may be used for the purpose of communication and interpretation of results. The investigator has to be use some statistical techniques to summarize and interpret the raw scores.

In the present study the investigator intended to study the relationship between environmental awareness (dependent variable) of students and the independent variables (Attitude Behaviour) and personal variables gender, SES, types of school and religion. To study the inter-relationships of these variables on the dependent variables, the
multiple correlation for the co-relation have been applied. The ‘t’ statistical has also been applied to find out the significance of differences between pre and post test and variables mentioned above.

a. ‘t’ test

In order to find out the difference in degree of environmental awareness on pre and post test of the selected samples on the basis of gender, religion and socio economic status.

\[ T = \frac{M_1 - M_2}{\sqrt{\frac{N_1 \sigma_1^2 + N_2 \sigma_2^2}{N_1 + N_2} - \frac{N_1 + N_2}{N_1 N_2}}} \]

Where;  
- \( M_1 \) = Mean of I group  
- \( M_2 \) = Mean of II group  
- \( Q_1 \) = S.D. of I group  
- \( Q_2 \) = S.D. of II group  
- \( N_1 \) = No. of cases on I group  
- \( N_2 \) = No. of cases on II group

Statistical Computations:

Depending upon the hypothesis the above statistical tests were applied to verify them. The entire statistical calculations were done on computers at the computer centre, A.M.U. The calculations so done were also manually checked randomly to ensure that the computer programme was correct.
3.8. References:


7. Mangal S. K., Statistics in Psychology and Education, Printice Hall in India
