CHAPTER – III

METHODS AND PROCEDURE

A research is considered to be a formal & systematic effort and intensive process in the direction of solution of a problem. Thus, research is a systematic method of operating certain variables under controlled conditions.

The present research work aims at studying the “Environmental Awareness among Secondary School Teachers in relation to their Gender, Subject-Area and Types of School with Special reference to their Socio-Economic Status (SES)”.

In any research the dependent variables are the measured changes in pupil performances attributable to the influence of the independent variables and the independent variables are the conditions or the characteristics that the experimenter manipulates in an attempt to ascertain their relationship to observed phenomena. Hence in the above mentioned study the dependent variable is “Environmental Awareness” while, the Independent Variables are “Gender, Subject Area, Type of School and Socio-Economic status”.

In this Chapter a description of the sample, its size, research tools, administration of tests, collection of data and statistical techniques used by the investigator for analyzing the data, have been presented.

The entire work has been set up under the following heads:

3.1 Sampling:
   a. Incidental Sampling

3.2 Description of the Tools Used:
   1. Description of developing Environmental Awareness Assessment Scale (EAAS)
      a) Collection & Writing of items
      b) Try out
c) Item Analysis  
d) Difficulty Index  
e) Discrimination Index  
f) Scoring  
g) Measuring Reliability of the Scale.  
h) Validity of EAAS.

2. Biographical Information Blank:

3.3 Data Collection:  
a. Collection of Data & Administration  
b. Scoring  

3.4 Statistical Techniques Used:  
a. t-Test  
b. Correlation i.e.; Multiple Correlation  

3.1 Sampling:  
To study the whole population is rather impracticable; a statistical process called sampling makes it possible on the basis of careful observations or of 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.

a. Incidental Sampling:

Incidental Sampling is also called as accidental sampling, opportunity sampling or convenience sampling and is a type of non-probability sampling, which involves the sample being drawn from a part of the population which is close to hand.

The accidental sampling refers to a sampling procedure in which the investigator selects the sample according to his convenience. Here the
researcher simply reaches out and picks up the cases that fall to hand, continuing the process till such time as the sample acquires a desired size.

The Sample population of this study consisted of 250 secondary school teachers of Private and Government Schools of Aligarh. Aligarh Muslim University (AMU) is a large center of learning, imparting education in Science, Social Sciences, Humanities, Engineering & Technology, Commerce, Management and Medical Sciences. Students from all over the world come here and benefit from different courses of studies.

A sample selected from the schools belonging to AMU may prove to be a representative one, for the purpose of generalizing the results on a broad basis.

Table 3.1 The school-wise distribution of sample is being presented here

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Name of the School</th>
<th>No. of Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Aligarh Public School</td>
<td>30</td>
</tr>
<tr>
<td>2.</td>
<td>Aligarh Modern Public School</td>
<td>30</td>
</tr>
<tr>
<td>3.</td>
<td>St. Fiedlis School (Junior)</td>
<td>30</td>
</tr>
<tr>
<td>4.</td>
<td>Our Lady of Fatima</td>
<td>25</td>
</tr>
<tr>
<td>5.</td>
<td>A.M.U. City High School</td>
<td>30</td>
</tr>
<tr>
<td>6.</td>
<td>Abdullah Girls High School</td>
<td>30</td>
</tr>
<tr>
<td>7.</td>
<td>S.T.S High School</td>
<td>30</td>
</tr>
<tr>
<td>8.</td>
<td>Iqra Public School</td>
<td>15</td>
</tr>
<tr>
<td>9.</td>
<td>Ayesha Tarin Modern Public School</td>
<td>15</td>
</tr>
<tr>
<td>10.</td>
<td>Qazi Para Girls High School</td>
<td>15</td>
</tr>
</tbody>
</table>

Total 250
A detailed description of the selected sample has been presented in the form of a Pie-diagram, which shows overall distribution of Gender, Subject Area, Type of School and Total Income in terms of Socio-Economic Status (HIG [High SES] and MIG [Low SES]. (Fig. 3.2).
Fig. 3.2 Pie-diagram showing overall distribution of Sample.
3.2 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 of the sample involved in the research work.

For measuring Environmental awareness of students, in the present study, the researcher went through different standardized tools. There are various tools to measure Environmental Pollution, Environmental Attitude and Environmental Awareness & Environmental Education, but no satisfactory tool was available to measure the environmental awareness. So the researcher himself developed a tool in the form of a questionnaire for measuring the Environmental Awareness. The details of developing this tool are being given below in the following few lines.

1. Description of developing the Environmental Awareness Assessment Scale (EAAS)

The above-mentioned tool (for measuring Environmental Awareness of students has been developed on Likert Method due to the following few reasons:

1) The Likert method of summated ratings is an easy method and has yielded scores very similar to those obtained by Thurstone method.

2) The coefficient of correlation between the scales was reported as high as +0.92. Since the Likert-type Scale takes much less time to construct, it offers possibility for the students of opinion research.

The first step in constructing a Likert Type Scale is to collect a number of statements about the subject. The correctness of statements is not important at this stage, as long as they express opinions held by a substantial number of people. It is important that they express agreement or disagreement to a
particular point of view and that the numbers of favorable and unfavorable statements are approximately equal.

After the statements have been gathered, a trial test should be administered on a sufficient number of subjects. Only those items, which correlate with the total test, have been retained. This testing of internal consistency helps to eliminate statements that are ambiguous or not of the same type as the items of the rest of the scale.

The present tool “Environmental Awareness Assessment Scale” purports to measure the extent and degree of awareness of people about environmental pollution and its protection.

This scale explores the understanding of people about the importance of environment in which they live and how far the efforts of Government through various legislations, mass awakening programmes of N.G.O. and other agencies through mass media, electronic media and print media could achieve their goals.

**a. Collection & 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 printed media, books, people etc. The researcher consulted a number of primary and higher primary school textbooks containing topics on various aspects of environment, prepared by state Government and centre (CBSE).

Apart from this, magazines, resource books of Environmental organization like The Annual Surveys on environment & newspapers, which contained columns or articles, were also consulted for pooling the items. Experts such as University Professors who are authorities in the field of environment were also consulted.

It was thus decided to construct an Environmental Awareness Assessment Scale (EAAS) based on the following dimensions of environment as a whole:-

a) Air Pollution

b) Water Pollution
c) Global action on Earth Environment.
d) Conservation of Natural Resources.
e) Diseases
f) Health & Hygiene
g) Sustainable Development
h) Environment Laws
i) Noise Pollution
j) Deforestation
k) Soil Pollution
l) Conservation of Forest and Wild Life

Thus with the availability of the resources which were available at hand, the various areas of Environmental Awareness Assessment Scale (EAAS) which have been mentioned above were taken.

It is important to decide the total number of items for a test. The items included in a test should be large enough to provide an adequate sample of student's behaviour 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. A researcher should see that the test is a power test, not speed test and also should see that there is enough time available, so that at least 80% of the students can attempt to answer every item.

Two hundred & fifty four (254) items, based on the above 12 dimensions were prepared. They were subjected to expert judgment where every item was required to be passed on its relevance to the content and criterion of Environmental Awareness. Experts were requested to content validate the scale items. This was done with a view to establishing content validity of the scale items. On the basis of their opinion & comments, 15 items had to be reframed and 170 items were deleted for overall ambiguity. Lists of Eighty four (84) items were then finalized.

Wang (1932), Thurstone & Chave (1929), Likert (1932), Bird (1940) and Edwards and Kilpatrick (1948) have suggested various informal criteria for
editing statements to be used in the construction of Attitudes Scale. Such guidelines may prove to be useful in constructing the awareness scale too.

Keeping in view the above guidelines, 254 items of objective type were prepared initially. These items were given to the experts to examine their relevance, content and language. On the basis of expert's evaluation and judgement, statements which had high loading, were selected for administration. Eighty four (84) out of the initial pool of 254 items were finally selected for the try out.

b. Try out:

The number of items constructed for try out is always considerably large than the number needed for the final test. All 84 items covered under the 12 areas of Environmental Awareness were administered for standardization of the EAAS to a sample of fifty (50) teachers first, which included teachers from Private, Semi-Private, and Government School. Teachers were then asked to respond to each item of the questionnaire which is in the form of Objective Type. Each & every teacher were asked to respond in the form of a tick marking the correct option which they think is the most correct and appropriate and leaving the rest of the options. Later, this tool was administered to a group of another 200 Secondary School teachers.

The responses obtained from this group were scored giving a weightage of ‘1’ to correct response and ‘0’ to the wrong response. Later these protocols were ranked from highest to lowest scores.

The total score varied from 0 to 84 showing lowest to highest Environmental Awareness. There are total 84 items covering all the 12 dimensions or areas covered under EAAS. Item Analysis is then done.

Item Analysis is mainly concerned with the Item Difficulty and Item Validity (ie; Discriminate Value).
c. Item Analysis:

Item Analysis of a test comes after the preliminary draft of the test has been constructed, administered on a group of students and scores.

Tabulation is done to determine the two important characteristics of each item.

i. Level of difficulty or Item Difficulty and

ii. Discriminating power of the test items.

Thus, these above two characteristics function as the criteria for selection and rejection of test items.

Thus, Item analysis is the process of examining teachers/ student’s responses to each test item. In terms of Objective Type test items; what one looks for is the difficulty and discriminating ability of the item as well as the effectiveness of each alternative.

Thus the Item Difficulty can be measured in three ways which are:-

i. Expert ranking of the Items in order of difficulty.

ii. Quickness by which the items can be solved and

iii. Calculation of the proportion of teachers solving the item correctly.

For Item analysis, on the strength of total scores, three groups were formed, the upper 27%, the bottom 27% and the middle 46%. Item Analysis was done on the basis of the extreme two groups, viz; Upper 27% and Lower 27%, where as the Middle 46% were left out.

The test constructor followed eight (8) steps for Item Analysis given as under:

1. First of all, test papers were scored with the help of scoring key and all the test papers were ranked and arranged from highest to the lowest scores.

   For the population above 100 and up to several thousands, 25% -27% grouping will be necessary.

2. From the orderly arranged set of papers, two extremes scores of upper 27% and Lower 27% group were taken for Item Analysis.
3. Middle 46% of the total score/ examinees/teachers were kept separately untreated.

4. For each item, number of pupils in the Upper and Lower groups who selected each alternative were tabulated.

5. In order to find out the proportion of the success & failure, the Difficulty Value of each item was computed by finding out the percentage of examinees, here teachers, who got the item correct. The Difficulty Index was computed from the examinees who got & marked right item option in Upper and Lower groups.

6. The Discrimination Index for each item was computed by finding the differences between the number of pupils in the Upper and Lower extreme groups, who marked the item right.

7. Finally, followed the process of items screening by eliminating and discarding very hard and very easy items and then retaining some workable items.

8. The percentage of the score of the two groups HAG & LAG groups was then calculated item –wise.

d. **Difficulty Index:**

Item Difficulty can be defined as the proportion of the examinees that marked the item correctly. The numerical term, which indicates the level of difficulty, is called Difficulty Index. For example; an item which is answered correctly by 655 students has Difficulty Index of 0.65. Generally items of moderate Difficulty (40-50-60% passing) are to be preferred to those, which are much easier or much harder.

If p is the proportion passing an item, q is (1-p), or proportion failing, the S.D. of the item (its variability) is square root of pq and its Variance (σ) is pq. The variance of an item is at its maximum when p=q= 0.5. Hence to bring out more individual differences (a greater spread) the Item Difficulty must be kept near 0.5.
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The Formula for the Item Difficulty Analysis is: -

\[ P_c = \frac{R - W}{(K-1)/N - HR} \]

in which,

- \( P_c \) = the percent of examinees who correctly know the answer (corrected index of Item Difficulty).
- \( R \) = the number of examinees who got the right answer.
- \( W \) = the number of examinees who got the wrong answer.
- \( N \) = the number of examinees in the sample.
- \( HR \) = the number of examinees who do not reach the Item and hence could not able to solve it.
- \( K \) = Number of alternatives in the item.

In our case, after calculating it was found that the percentage or proportion of Item Difficulty for the above 27% examinees or teachers is \( = 0.89 \), that is the Upper 27% have got the Item Difficulty Value, which is \( = 0.89 \) and the proportion in the Lower Group passing the item is \( P_{lower} = 0.247 \).

Therefore the Total Percentage of lower group = 0.247

\[ DI = \frac{P_u + P_l}{Total\ Index} = 0.89 + 0.247/2 \]

Or Difficulty Index (DI) = .57

Therefore, the total Index or Average of Difficulty Index is = 0.57

e. Discrimination Index or Item Validity:

Item Discrimination or the discriminating power of a test item refers to the degree to which success or failure of an item indicates possession of the ability being measured.

Discrimination Index is defined as the index indicating the ability of the item to discriminate (positively) between the higher ability students and lower ability students. Discrimination is usually measured by the correlation between the score on the item and the score on the total test. In theory, values of DI may range from -1.00 to + 1.00.
A value greater than + .30 among a sample of candidates numbering 150 or more generally indicates a satisfactory degree of discrimination.

Values between 0 & .30 indicate that these items need improvement while those with negative values must be discarded.

The procedure involved in measuring Discrimination Index involves the following eight steps: -

1) Administration of the draft test on a sample of 50 (in our case) teachers.
2) Identification of upper 27% and bottom 27% examinees. (Having highest and lowest scores in rank order respectively on the total test.
3) Calculation, in respect of each item, of the percentage/ proportion of the examinees, attempting it correctly.
4) The Discrimination Index will be given by the following formula: -

\[ DI = P_u - P_l \]

in which, DI = Discrimination Index
\[ P_u = \text{Proportion in the Upper group passing the item} \]
\[ P_l = \text{Proportion in the Lower group passing the item} \]
5) The DI can be tested for significance by using a critical ratio test. Item with a positive & significant differences are retained.
6) The values of the DI i.e.; Discrimination Index can range from -1.00 through zero to +1.00.
7) An item is said to have negative discrimination power if poor students answer it correctly more often than the good students or \( P_u < P_l \).
8) Items having negative discrimination are rejected. Items having discrimination index above 0.20 are ordinarily regarded satisfactory for use in most tests of academic achievement.

In our case the total Discrimination Index is: -

\[ DI = P_u - P_l \]

where, \( P_u = 0.89 \), & \( P_l = 0.24 \)

Therefore, \( DI = 0.89 - 0.24 = 0.65 \)
or \( DI = +0.65 \)
Therefore, the total Discrimination Index is = +0.65
Since our DI is + 0.65, thus it is way above 0.20, thus it is concluded that the items selected are satisfactory and items are able to discriminate satisfactorily between good & poor students.

f. Scoring Procedure:

Scoring Procedure of the test was very simple. For scoring one correct or item marked is regarded as one point, or one mark & no mark or consideration for any wrong answer. Scoring has been done with the help of scoring key made by the investigator. The marked answers/items were compared with the scoring key and every correct answer was given one mark and every wrong answer item marked with zero mark and accordingly marks were allotted. The total marks were counted & then marks were given out of the total 84 items. Marks according to the right & wrong answers were given for all the 84 items on all 250 answer sheets or questionnaire sheets.

g. Reliability (Measuring Reliability):

The test score is said to be reliable when the scores are stable and trustworthy. Stability and trustworthiness depend upon the degree to which the score is an index of the true ability or is free of chance error.

For finding out the Reliability of the Scale i.e.; EAAS the test (including 50 items) was divided into 2 parts for testing the reliability of the scale. Thus Split-Half Method was used.

To establish the reliability of the tool, the Split Half Method was employed. The scores obtained from the try out-group of 50 teachers on the test were divided into two equivalent halves and the correlation was found for these half tests using the formula of Pearson's Product Moment Coefficient of Correlation (PPMCC).

\[
r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}
\]  
(1)
From the reliability of the half-test, the self-correlation of the whole test was eliminated by the Spearman–Brown Prophecy Formula.

The procedure adopted for calculating Coefficient of correlation is by arranging two sets of scores which were formed by taking the alternate items in the test.

1. The first set of scores represents the Test I having odd number items —-1, 3, 5, 7, 9 etc.
2. The second set of score represent the Test II having even numbered items —2, 4, 6, 8, 10.
3. Then we can find out the Coefficient of Correlation between the odd numbered & even numbered items for student, Pearson Product Moment Coefficient of Correlation was used.

Reliability for Half Test by using Formula of PPMC: -

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

Where \( \sum X \) = Sum of the X Scores  
\( \sum Y \) = Sum of the Y Scores  
\( \sum X^2 \) = Sum of the squared X Scores  
\( \sum Y^2 \) = Sum of the squared Y Scores

where, \( N = 25 \)

\[
\sum X = 1244, \quad \sum Y = 1256, \quad \sum X^2 = 62528, \quad \sum Y^2 = 63770
\]

\[\& \sum XY = 63072\]

\[
r = \frac{25 \times 63072 - (1244)(1256)}{\sqrt{25 \times 62528 - (1244)^2} \sqrt{25 \times 63770 - (1256)^2}}
\]

Or \( r = 0.89 \)
Thus, reliability of the half test was found to be $= 0.89$ & with this value, Reliability of the whole test was calculated by using Spearman-Brown Prophecy formula for whole test from Split-halves as:-

$$r = \frac{2r_1/2 \times 1/2}{1 + r_1/2 \times 1/2}$$

Or

$$r = \frac{2r}{1 + r} \quad (3)$$

$$r = \frac{2 \times 0.89}{1 + 0.89}$$

Or

$$r = 0.94$$

Table 3.2 Reliability values of the scale.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Reliability</th>
<th>Coefficient of Correlation</th>
<th>Index of reliability ($r$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Split Half</td>
<td>$r = 0.89$</td>
<td>0.94</td>
</tr>
<tr>
<td>2.</td>
<td>For full length test</td>
<td>$r = 0.94$</td>
<td>0.96</td>
</tr>
</tbody>
</table>

**h) Validity of EAAS:**

In general, a test is valid if it measures what it claims to measure. However, Validity may be defined in a number of ways.

(i) **Content Validity:**

Content Validity is also called “Circular Validity” and is most widely used in achievement testing.

Content Validity refers to the degree to which the test actually measures or is specifically related to the traits for which it was designed. It shows how adequately the test samples the universe of knowledge and skills that a researcher is expected to master.

For establishing Content Validity the scale was carefully examined and given to a group of experts. They were asked to give their judgement about the
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relevance, content and language of the items. Thus EAAS’s Content Validity was assured.

The reliability coefficients calculated for the test were 0.89 & 0.94 for Split-half and full length test respectively.

The prepared scale shows high degree of reliability and validity. From the facts and figures mentioned above it is clear, that the tool is capable of assessing the environmental awareness of teachers and the teachers can be ranked on the basis of obtained scores.

The final Draft has been finally named as “Environmental Awareness Assessment Scale (EAAS)”.

A copy of the Environmental Awareness Assessment Scale (EAAS) has been attached (see Annexure-II).

Table 3.3 Total number of Final scale items distributed over different areas.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Areas</th>
<th>Serial No. Of Items in the Final Scale</th>
<th>Total No. of items in each area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Air Pollution</td>
<td>28,14,48,24,52,20,43,51,54</td>
<td>09</td>
</tr>
<tr>
<td>2.</td>
<td>Water Pollution</td>
<td>8,11,41,66,81,84</td>
<td>06</td>
</tr>
<tr>
<td>3.</td>
<td>Noise Pollution</td>
<td>5,18,29,57</td>
<td>04</td>
</tr>
<tr>
<td>4.</td>
<td>Soil Pollution</td>
<td>45,49,50,59,60</td>
<td>05</td>
</tr>
<tr>
<td>5.</td>
<td>Global action on earth environment</td>
<td>1,21,36,55,56,79,80,19</td>
<td>08</td>
</tr>
<tr>
<td>6.</td>
<td>Conservation of natural resources</td>
<td>2,10,13,22,31,38,40,61,63,68,65</td>
<td>11</td>
</tr>
<tr>
<td>7.</td>
<td>Diseases</td>
<td>7,3,9,12,4,23,42,83</td>
<td>08</td>
</tr>
<tr>
<td>8.</td>
<td>Health &amp; Hygiene</td>
<td>15,16,27,30,47,46,53,82,32</td>
<td>09</td>
</tr>
<tr>
<td>9.</td>
<td>Sustainable development</td>
<td>58,62,67,76,75,74,78</td>
<td>07</td>
</tr>
<tr>
<td>10.</td>
<td>Environmental Laws</td>
<td>69,70,71,72,73</td>
<td>05</td>
</tr>
<tr>
<td>11.</td>
<td>Deforestation</td>
<td>17,39,37,64</td>
<td>04</td>
</tr>
<tr>
<td>12.</td>
<td>Conservation of forests &amp; Wild life</td>
<td>6,25,26,33,34,35,44,77</td>
<td>08</td>
</tr>
</tbody>
</table>

TOTAL ITEMS 84
2. **Biographical Information Blank:**

A Biographical Information Blank was prepared along with the EAAS by the investigator to gather personal information about the subjects selected in the sample. The BIB includes name, age, sex, academic streams, Type of institution, Grade (TGT/PGT) Subject Taught, Teaching Experience (in years) and monthly income of the parent.

A copy of Biographical Information Blank, which is present in the Environmental Awareness Assessment Scale (EAAS), is being attached (See Annexure-I).

3.3 **Data Collection & Administration of the test**

a. Administration of the test and collection of the Data:

b. Scoring

a. **Administration of the test and collection of the Data:**

After the selection of the sample and the required tools the task before the investigator was to collect data. As the collection of data is very tedious process, time consuming & is filled with lot of difficulties, the investigator himself repeatedly went to all schools whether Private, Semi-Private or Government schools of Aligarh, for the administration of the EAAS questionnaire.

The actual administration was preceded by a brief talk with the principal of each school with a view to explain the purpose of the investigation and to get his/her help and cooperation and the permission for the same.

The investigator accessed each school and met each & every teacher of the school personally and distributed the questionnaire. The investigator with the permission of the principal of each school, collected data from the teachers teaching various subjects from class 1st to class 10th of all the four disciplines viz; Science, Social Science, Humanities (Arts) & Commerce. Since the Commerce group teachers were very few, therefore it was not counted or taken for the present study. Thus only three groups were taken for the present study of research.
The investigator first distributed the EAAS along with the answer sheets to every teacher. He then read out the instructions for filling up the answer sheets & all the teachers were asked to fill the Biographical Information Blank, which was attached with the questionnaire.

The researcher gave the teachers of various academic streams a time limit of one (01) hour and asked them to give back the questionnaire after furnishing & filling the required questionnaire as correctly as possible.

The investigator went to all the ten schools of Aligarh & distributed questionnaire to 250 secondary school teachers.

b. Scoring:

After collecting the data, a detailed scoring sheet was prepared for the assessment of Environmental Awareness in secondary school teachers. The scoring procedure was very simple. There are 84 items in EAAS. Each item carries the value of 1 mark and each one correct answer is regarded as one point, or one mark, and no mark or consideration for wrong answer. Thus, on the total scale the scores ranged between 0–84. The scale gives composite scores of Environment Awareness ability of the subject.

The total marks obtained by each respondent were written on each answer sheet. The researcher checked the answer sheets of all the 250 respondents, & then the marks of each subject were summed up and written on the sheet.

3.4 Statistical techniques used:

In the present study the researcher intended to study the relationship between Environmental Awareness (the dependent variable) of teachers and the independent variables, viz; Gender, Subject Area, Type of School, and Socio-economic Status i.e.; Socio-economic background. The ‘t’ statistical technique has been applied to find out the significance of difference between dependent and independent variables mentioned above, and Karl Pearson’s Product Moment Correlation Coefficient, technique has been applied so as to find out the correlation between various variables.
a. **T-Ratio:**

In order to find out the difference in the degree of Environmental Awareness of the selected sample on the basis of Gender, Subject Area, Type of the Institution, and SES, ‘t’ ratio has been used. The test of the significance of the difference between the two means is known as ‘t’ test. It involves the computation of the ratio between the experimental variance (observed difference between two sample means) and error variance (the sampling error factor), **J.W.Best.** The ‘t’ ratio can be used to translate a sample mean difference into units of standard error of the difference.

By Formula: -

\[
t = \frac{X_1 - X_2}{\sigma_{\text{diff}}}
\]

where,

- \(X_1\) = Mean of the first sample
- \(X_2\) = Mean of the second sample
- \(\sigma_{\text{diff}}\) = Standard error of the difference

\[
t = \frac{M_1 - M_2}{\sqrt{\frac{N_1 \sigma_1^2 + N_2 \sigma_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}
\]

where,

- \(M_1\) -------------- \(\rightarrow\) Mean of I group
- \(M_2\) -------------- \(\rightarrow\) Mean of II group
- \(\sigma_1\) = Std deviation of I group
- \(\sigma_2\) = Std deviation of II group
- \(N_1\) = No. of cases in I group
- \(N_2\) = No. of cases in II group

Or

\[
t = \frac{M_1 - M_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}}
\]
b. Correlation:

Correlation is concerned with describing the degree of relation between variables.

The method of Correlation is developed by Francis Galton in 1885 as he published a paper on the topic “Regression towards Mediocrity in hereditary status”.

The most widely used measure of Correlation is the Pearson’s Product Moment Correlation Coefficient (r). This measure is used where the variable are quantitative i.e.; on the interval or ratio scale.

Definition of Correlation:

Correlation is defined as “whenever two variables of the same group are so related that the increase or decrease are correspond to the increase or decrease to another or conversely, increase or decrease corresponds to the decrease or increase to another, these are said to be correlated.”

i) Karl Pearson’s Product Moment Coefficient of Correlation (P.M.C.C):

Pearson Product Moment Correlation Coefficient is ‘r’.

The formula for P.M.C.C is:

\[
 r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}
\] (7)

The entire statistical calculation was done on computers at the Computer Centre, Aligarh Muslim University. The calculations so done were also manually checked randomly to ensure that the computer programme was correct.
REFERENCES