# C H A P T E R - IV

## DESIGN OF THE STUDY

The main objectives of the present study were to collect baseline data pertaining to environmental knowledge, attitude and perception regarding environmental education of pre-service and in-service secondary school teachers. In addition, relationship between variables like sex, place of residence, subject orientation, socio-economic background and teaching experience and environmental knowledge and attitude was to be investigated. In order to achieve these objectives, data relating to these parameters were required. Instruments were developed to collect the required data and administered over a chosen sample of in-service and pre-service secondary school teachers, following a definite procedure. Data, thus, collected were analysed and interpreted using statistical techniques to conclude about the objectives. This in a nutshell is the design of the study. This is presented under the following heads :

- Data Requirement
- Sample
- Instrument Development
- Procedure for Data Collection
- Data Analysis and Interpretation Procedure

### Data Requirement

In order to achieve the stated objectives and test the concerned hypotheses, the following data were required :

- Data pertaining to factual, conceptual and total environmental knowledge,
- Data pertaining to environmental attitude,

- Data pertaining to perception regarding environmental education, and
- Personal data relating to sex, place of residence, subject orientation, socio-economic background and teaching experience of pre-service and in-service secondary school teachers.

Thus, sources of all the data were the in-service and pre-service secondary school teachers.

**Sample**

All the in-service teachers of secondary schools and pre-service teachers of B.Ed. training colleges in the district of Puri in Orissa state formed the population, for the study. There were three teacher training colleges and 483 secondary schools in the district. Out of this population, a small representative sample was drawn in the following manner.

A sampling frame consisting of all the secondary schools and teacher training colleges of the district was prepared. The list of secondary schools and teacher training colleges were obtained from the Directorate of Secondary Education and of Higher Education respectively. The number of schools and teacher training colleges of different categories has been shown in Table 4.1 and Table 4.2 respectively.

**Table - 4.1**

Teacher Training Colleges in Puri District

| | Boys | Girls | Co-educational | Total |
|---|---|---|---|---|
| Rural | - | - | 1 | 1 |
| Urban | - | 1 | 1 | 2 |
| Total | - | 1 | 2 | 3 |

**Table - 4.2**

Secondary Schools in Puri District

| | Boys | Girls | Co-educational | Total |
|---|---|---|---|---|
| Rural | 14<br>(2)* | 36<br>(4) | 360<br>(36) | 410<br>(42) |
| Urban | 20<br>(2) | 19<br>(2) | 34<br>(4) | 73<br>(8) |
| Total | 34 | 55 | 394 | 483 |

* Figures within brackets indicate number of schools selected for the sample.

Sampling of in-service teachers was done in two stages. Fifty schools comprising more than ten per cent of all the secondary schools in the district were selected first on a stratified random sampling basis. For stratification variables like boys, girls, co-educational, urban and rural were taken into consideration. The number of schools of different categories were selected in the proportion,

in which they existed in the population (Table 4.2). Having selected the schools, all the teachers teaching in classes VIII, IX and X in these 50 schools were included in the sample.

There were only three secondary teacher training colleges in the district viz. Regional College of Education and Nalini Devi Women's College of Education at Bhubaneswar, and Paramananda College of Education at Bolgarh. All the pre-service teachers in these colleges constituted the sample of pre-service teachers. The final sample, therefore, consisted of 302 in-service and 416 pre-service secondary school teachers of Puri district.

**Instrument Development**

Since no standardised Indian instrument to measure environmental knowledge, attitude and perception regarding environmental education was available, the investigator decided to develop the following instruments for collection of required data for the study.

- Environmental Knowledge Inventory
- Environmental Attitude Scale
- Questionnaire on Perception regarding Environmental Education.

While developing these instruments, the investigator took special care to include all those items which can normally be expected from an 'environmentally literate' individual. All the instruments were developed through three stages viz. preparation of the first draft based on study of literature, revision of the draft instrument on the basis of expert

opinion and pilot study. The detailed methods of development of the individual instruments are given separately.

Environmental Knowledge Inventory

In view of the wider scope of the term 'environment' it was decided to include the following aspects of environment in the instrument by referring to current literature and in consultation with experts in the field.

(i) Population explosion
(ii) Pollution
(iii) Deforestation
(iv) Ecological disruption
(v) Depletion of natural resources
(vi) Land use
(vii) Extinction of species
(viii) Energy crisis

It was further decided to measure environmental knowledge of teachers at factual and conceptual level. The eight areas of environment stated above were thoroughly analysed and a matrix (Table 4.3) was prepared to serve as the basis for framing factual and conceptual items.

**Table - 4.3**

Facts and Concepts relating to Environmental Knowledge

| Areas of Environment | Related Facts | Related Concepts |
|---|---|---|
| 1 | 2 | 3 |
| (i) Population Explosion | 1. World population figure | 1. Zero population growth. |
| | 2. Population projection by 2000 AD | 2. Population density and human behaviour |
| | 3. Population growth rate. | 3. Family size and education of parents. |
| | 4. Comparison of projected population of India vs. China. | |
| | 5. Causes of rapid population growth in India. | |
| | 6. Consequences of population explosion | |
| | 7. Population resource relationship. | |
| | 8. Controlling population explosion. | |
| | 9. Medical termination of pregnancy. | |
| | 10. Methods of contraception | |
| | 11. Incentives for family planning. | |
| (ii) Pollution | 1. Causes of water pollution | 1. Acid rain |
| | 2. Criteria for water quality. | 2. Genetic change due to radiation. |

| 1 | 2 | 3 |
|---|---|---|
| | 3. Water-borne diseases | 3. Affluence and poverty cause pollution |
| | 4. Toxicity of DDT | 4. Pollution changes environment |
| | 5. Minamata tragedy | 5. Food additives |
| | 6. Lake eutrophication | 6. Jet planes deplete ozone. |
| | 7. Ganga Action Plan | |
| | 8. Causes of air pollution | |
| | 9. Smog. | |
| | 10. Bhopal gas disaster | |
| | 11.Tajmahal eroded by Mathura refinery | |
| | 12.Consequences of ozone depletion | |
| | 13.Greenhouse effect | |
| | 14. Green belt. | |
| | 15. Agents of noise pollution | |
| | 16. Nuclear power plant hazards. | |
| | 17. Chernobyl accident | |
| (iii) Deforestation | 1. Ideal forest cover | 1. Social forestry |
| | 2. Satellite imagery of forest cover | 2. Deforestation and climatic change |
| | 3. Tropical rain forests | |
| | 4. Chipko Movement | |
| | 5. Sunderlal Bahuguna | |

| 1 | | 2 | 3 |
|---|---|---|---|
| (iv) | Depletion of Natural Resources | 1. Classification of natural resources | 1. Limited nature of resources |
| | | 2. Recycling | 2. Space-ship earth. |
| | | 3. Sea-bed mining | 3. Resources use and development |
| | | | 4. Distribution of natural resources |
| | | | 5. Alternative technology |
| (v) | Ecological Disruption. | 1. Role of decomposers | 1. Interdependence |
| | | 2. Biodegradation | 2. Self-cleansing in nature. |
| | | 3. Integrated pest management | 3. Ecosystem stability |
| | | 4. Crop-rotation and monoculture | 4. Chain reaction in ecosystem |
| | | 5. Consequences of fossil fuel burning | 5. Adaptation |
| | | 6. Silent Valley Project | 6. Biomagnification |
| | | 7. BALCO agitation | 7. Greenhouse effect |
| | | 8. Causes of environmental problems | 8. Dams and ecology |
| | | | 9. Pest-resistance |
| | | | 10. Nuclear-winter |
| | | | 11. Nature of environmental problems |
| | | | 12. Man environment relationship |

| 1 | 2 | 3 |
|---|---|---|
| (vi) Land Use | 1. Definition of land use | 1. Soil erosion |
| | 2. Agitation at Baliapal | 2. Desertification |
| | | 3. Land use pattern |
| (vii) Extinction of Species | 1. Causes of extinction | 1. Gene erosion |
| | 2. Red Data Book | 2. Tolerance |
| | 3. National Parks in Orissa | 3. Carrying capacity |
| | 4. Wild-life sanctuary in Orissa | 4. Safe-number |
| | 5. World-wide Fund for Nature | 5. Killing helps conservation |
| | 6. Contributions of Dr. Salim Ali | 6. Captive breeding |
| | | 7. Wild-life sanctuary |
| (viii) Energy Crisis | 1. Future energy sources | 1. Sun as ultimate sources of all energy. |
| | 2. Import of crude oil for India. | 2. Biogas plant |
| | 3. Challenges for solar energy | |
| Total No.of items. | 55 | 40 |

The items were developed from the matrix. The 'Environmental Knowledge Inventory'consisted of two parts. The first part, contained the factual knowledge items, developed in a multiple choice type format, the second part, consisted of the conceptual knowledge items, developed in an yes-no-do not know-format. The first draft was sent to a panel of nine experts (Appendix-III) who were involved in national level environmental organisations for critical examination and comments to improve the questionnaires. They were requested to point out inaccuracies, inconsistencies and suggest alternative items wherever required.

The instrument has validy, as obvious, from the manner in which it has been developed. The test-retest reliability of the instrument was established by administering it on a randomly selected 50 in-service and 50 pre-service teachers, who had earlier responded, by re-administering the instrument after an interval of one week. The reliability coefficients were as follows :-

Part-I(Factual Environmental Knowledge)-0,67
Part-II (Conceptual Environmental Knowledge)-0.72
The instrument as a whole -0.69

The values of reliability coefficients indicate near high reliability of the instrument.

Environmental Attitude Scale

The items, of a Likert type five point environmental attitude scale developed for measuring environmental attitude, were decided from a study of related literature and in consultation with experts. The items were so phrased that they expressed an environmental ethic which supported

the well being and survival of man in harmony with nature through sustainable development, keeping life supporting systems of the earth intact. Both positive and negative statements in consonance with the above viewpoint were prepared. The items were expected to generate strong reactions among the respondents. The first draft of attitude scale was sent to the panel of experts mentioned earlier, requesting them to examine each statement and classify them as either environmentally positive, negative or as neither. The neutral items as indicated by judges were eliminated from the first draft. The draft attitude scale after this elimination, contained 42 items, 21 positive and 21 negative. A pilot study was conducted with these 42 items with the sample described earlier. The teachers were told during the pilot study that there were no 'wrong' or 'right' response to the items. They were to express their free and frank opinion (agreement or disagreement on a five point scale-viz.-strongly agree, agree, undecided, disagree,strongly disagree) on each item. The internal efficiency of each item was found out by computing the coefficient of correlation between scores on each item and total score. The discrimination index of each item of the scale was also computed. Items with negative discrimination index and low internal efficiency were eliminated. The final scale contained 30 items, 16 of which indicated a positive attitude towards environment and 14 expressed negative attitude towards environment. Of the 30 items retained in the final scale, 20 were developed by the investigator and 10 were taken from list of concepts in environmental education developed by Roth et al (1970). The reliability of the environmental attitude scale was established using the test-retest method described earlier. The coefficient of correlation was o.63 which indicates moderate reliability. The scale has validity as evident from the manner of its development.

Questionnaire on Perception regarding Environmental Education

This questionnaire was essentially intended to find out the perception of teachers regarding the pedagogic aspects of environmental education. Omnibus type format was used for the questionnaire. It dealt with teacher's perception regarding meaning, objectives and philosophy of environmental education, its place in school curriculum, organisation of content, concepts in environmental education, training needs of teachers, sources of environmental knowledge, constraints in implementing environmental education programme. Items on teachers' perception of environmental crisis, most serious environmental problems of the country and world, core-curriculum in environmental education, flexibility of the existing school schedule, etc., were also included in this questionnaire. A panel of experts from the faculty of education critically examined the items, before the questionnaire was tried-out in a pilot study as described earlier. The final version of the questionnaire after modification and improvement contained 21 items as against 22 items in the pilot study.

A personal data sheet was prepared to get information about sex, place of residence, educational background, subject orientation, teaching experience and socio-economic background of teachers. For a quick appraisal of socio-economic background of a teacher, the investigator took into consideration three indices-family income, educational qualification and occupation of parents in case of pre-service teachers. Family income, educational qualification and occupation of self and spouse were taken into consideration for in-service teachers. Based on the average pooled weightage given to these indices, a teacher was placed in high, middle or low socio-economic background. The weightage

given to different indices of this socio-economic background appraisal sheet, arrived through the consensus opinion of a panel of experts, is given in Appendix-IV. Finally, the instruments were printed in the form of a booklet. After the personal data sheet, a few lines addressed to the teacher, explaining the background and the purpose of the study was included. The teachers were informed that the questionnaire should not be seen as a test for their knowledge, rather it should be seen as their endeavour in designing environmental education programme. These lines were intended to assuage the ruffled feelings of those teachers who did not take the instrument administration in its proper spirit. The investigator had gathered this experience during the pilot study. The booklet containing the printed instruments is given in Appendix-II. Appendix-I is an English version of the instruments.

**Procedure for Data Collection**

The investigator tried to get cooperation from educational authorities controlling the secondary schools and teacher training colleges of Puri district. He met the Director, Higher Education, Secondary Education, the Principal of Regional College of Education, Bhubaneswar and the Inspector of Schools, Puri District with a letter of introduction from Head, CASE, Baroda. The purpose of the study and its need was explained to them and their permission was solicited for administration of the instrument among the in-service and pre-service teachers concerned. After obtaining permission, dates were fixed for visit to secondary schools and teacher training colleges in consultation with Headmasters of schools and Principals of training colleges respectively.

In the teacher training colleges the investigator met the pre-service teachers in classrooms and administered the questionnaires. Elaborate instruction regarding directions to answer the instruments were given first. Although no time limit was given to answer the instruments, it took about 90 minutes to answer the booklet. All care was taken to include all the students. In the secondary schools the investigator met the heads and other teachers teaching in classes VIII, IX and X in the staff common room on the appointed day. The purpose of the study and the directions to answer the instruments were explained to them. The teachers on the average took ten days time to go through the questionnaire and answer them. The questionnaires were collected from the teachers individually. At the time of collecting the questionnaire, the researcher took special care to see that the teachers had answered all items. Cases of incomplete questionnaires were discussed with teachers concerned individually and any doubt or clarification were given on the spot. Out of 302 in-service teachers in the sample 220 returned yielding a return rate of nearly 73 per cent. Since out of the 416 pre-service teachers in the sample 73 had left the college before completion of the course, the investigator's scope was limited to 343 pre-service teachers. However, only 297 such teachers were available on the days of administration of the instruments and all of them returned the questionnaire, yielding a return rate of nearly 87 per cent.

## Scoring and Tabulation of Data

The data were scored manually by the investigator. For scoring the items on factual environmental knowledge, each correct alternative of the multiple choice type items was credited with one mark. The score on individual items

were added up, to give a factual environmental knowledge score for each teacher. In the similar manner conceptual environmental knowledge score was obtained for each teacher, by adding up the scores on each correctly answered conceptual item. Each correctly answered conceptual item was given a credit of one mark. The factual and conceptual knowledge score of each teacher was added up again to give a 'total environmental knowledge score'. The environmental knowledge inventory thus, yielded three scores for each teacher viz.

- Factual Environmental Knowledge Score (F)
- Conceptual Environmental Knowledge Score (C)
- Total Environmental Knowledge Score (T=F+C)

In additon to the above, the frequency of response to each alternative in terms of percentage was calculated for in-service and pre-service group of teachers as a whole.

The five alternatives to each item of 'Environmental Attitude Scale' was scored in the following manner :

| Alternatives | Score given to items expressing | |
|---|---|---|
| | Positive Attitude | Negative Attitude |
| Strongly Agree | 5 | 1 |
| Agree | 4 | 2 |
| Undecided | 3 | 3 |
| Disagree | 2 | 4 |
| Strongly disagree | 1 | 5 |

The score on each item of the scale was then added up to give total attitude score. The items in 'Questionnaire on

Perception regarding Environmental Education' were omnibus type. The frequency of responses to different alternatives for each item was added up for different groups and expressed in terms of percentage.

The data were recorded on master tabulation sheets (MTS) after numbering the samples in the form of matrices. The total of each column gave the total frequency response to alternative of the item. The total for the row gave the score of the teacher for that questionnaire. Separate MTSs were prepared for each instrument and the personal data were recorded separately on a different sheet. From the master tabulation sheets data were drawn on individual sheets as per objectives and hypotheses.

## Data Analysis and Interpretation Procedure

The average scores on factual and conceptual environmental knowledge of the in-service and pre-service teachers were computed. Item-wise analysis of factual and conceptual environmental knowledge was also carried out to identify deficiency in environmental knowledge among teachers. In the absence of norms for interpreting the performance of teachers, the help of a panel of experts from areas of education and psychometry was taken to interpret the scores. As per the unanimous decision of this panel the criteria as given in Table 4.4 for interpreting the average score on environmental knowledge was arrived at.

**Table 4.4**

Norms for Interpretation of Average Score on Environmental Knowledge Inventory.

| Criterion | Interpretation |
|---|---|
| Average factual/conceptual environmental knowledge score as percentage of maximum possible score | |
| Less than 50 | Low knowledge |
| 50-75 | Moderate knowledge |
| More than 75 | High knowledge |

It was also decided that teachers as a group will be considered to have 'Deficient Knowledge' about an item if 60 per cent or more of them fail to answer correctly that item.

The knowledge level of the teachers was also interpreted by drawing ogives for pre-service and in-service teachers' performance on factual and conceptual environmental knowledge.

Since there were 30 items in the 'Environmental Attitude Scale' and a score of 3 indicated a neutral attitude for each item, a total attitude score of 90 indicated a neutral attitude towards environment. Scores above 90 indicated a favourable or positive attitude towards environment. On the contrary, an attitude score less than 90 indicated an unfavourable or negative attitude towards environment. The perception regarding environmental

education was analysed in terms of percentage of responses to various alternatives of the items concerned. To find out the correlation between environmental knowledge and environmental attitude, product-moment correlation was computed between the scores on these two measures. To determine if significant differences existed among teachers in their environmental knowledge and attitude, with reference to variables like sex, place of residence, subject orientation, teaching experience etc. 't-test' and 'Analysis of Variance' techniques were used on the scores on environmental knowledge and attitude.

## Limitations of the Study

Following were some of the limitations of the study.

- The sampling of independent variables like sex, place of residence, subject orientation, teaching experience and socio-economic background were incidental, as they occured naturally in the sample.
- The study was confined only to Puri District of Orissa.
- In the absence of any standardised instrument to measure environmental knowledge, attitude and perception regarding environmental education, the investigator developed these instruments. The instruments might suffer from all the inherent limitations of a teacher made test in spite of investigators' best efforts.
- The criterion decided for evaluating the performance of teachers on 'Environmental Knowledge Inventory' is arbitrary and is based on the opinion of experts in the field.

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