### CHAPTER - III

**METHODOLOGY OF THE STUDY**

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3.0 Introduction

After defining the problem of the present study and reviewing the related literature on the area of study, the next step was to decide an accurate strategy with a view to constructing the desired instrument and carrying out further investigation with the help of the resultant instrument. A successful research depends on the kind of methodology and procedure followed in conducting any study. Therefore, it is very much essential to adopt a sound and systematic strategy to carry out the present investigation. This chapter presents the details of the method undertaken to conduct the study investigation.

3.1 Locale of the Study

The present study has been conducted in East Khasi Hills District which consisted of Higher Secondary Science Students, (both male and females) studying in the Higher Secondary Schools.

3.2 Methodology

(i) Method

Descriptive Method was used in the study as it is more than just a collection of data. It involves measurement, classification, analysis and interpretation.

(ii) Population of the Study

A Population is a group of individuals that have one or more characteristics in common that are of interest to the researcher. It may be all the individuals of a particular type or more restricted part of that group.

In the present study the population consisted of all the Higher Secondary Science Students studying in the Schools located in East Khasi Hills District.

The population of the study is shown in the table below:

**Table 3.1  Population of the Study**

<table>
<thead>
<tr>
<th>Type of Institutions</th>
<th>No. of Boys</th>
<th>No. of Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>56</td>
<td>96</td>
<td>152</td>
</tr>
<tr>
<td>Deficit</td>
<td>1173</td>
<td>725</td>
<td>1898</td>
</tr>
<tr>
<td>Private</td>
<td>319</td>
<td>457</td>
<td>776</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1548</strong></td>
<td><strong>1278</strong></td>
<td><strong>2826</strong></td>
</tr>
</tbody>
</table>

*Source: Inspector of School, East Khasi Hills District, Meghalaya.*

(iii) **Sample of the Study**

A sample is a small proportion of a population selected for observation and analysis. It is a part of any collection of things, individuals or results of operations that are quantitatively expressed\(^{284}\). Hence the sample of the study is shown in the table below:

The sample of the study is shown in the table below:

**Table 3.2  Sample of the Study**

<table>
<thead>
<tr>
<th>Type of Institutions</th>
<th>No. of Boys</th>
<th>No. of Girls</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tribal</td>
<td>Non Tribal</td>
<td>Total</td>
</tr>
<tr>
<td>Government</td>
<td>32</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>Deficit</td>
<td>165</td>
<td>44</td>
<td>209</td>
</tr>
<tr>
<td>Private</td>
<td>105</td>
<td>39</td>
<td>144</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>302</strong></td>
<td><strong>83</strong></td>
<td><strong>385</strong></td>
</tr>
</tbody>
</table>

\(^{284}\) Aditham Bhujanga Rao, “Research Methodology for Management and Social Sciences”. *Excel Books*
(iv) **Tools Used**

The following tools were used in the study:


1. **A Scientific Attitude Scale (1985) by S.C. Gakhar and Amandeep Kaur**

**Introduction**

During the past four decade a number of instruments have been deported for measuring attitude relevant in science education, some of which have been used in research studies. Victor (1935)\(^{285}\) constructed an instrument base on the definition of six components of the scientific attitude, namely,

(a) Accuracy in all operation including calculation, observation and report
(b) Intellectual honesty
(c) Open-Mindedness
(d) The Habit of Suspended Judgement

Another instrument to measure scientific attitude was developed by Diederich (1967)\(^{286}\) in which he used twenty components to define scientific attitude.

Srivastava (1980)\(^{287}\) had given the major components of scientific attitude as rationality, curiosity, open mindedness, aversion to

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\(^{286}\) P.B. Diederich, “Components of the Scientific Attitude”. *The Science Teacher, Vol. 34*(2)
superstition, objectivity intellectual honesty, suspended judgement, cause and effect relationship, seeks evidence and evaluation.

Vaidya (1971)\textsuperscript{288} has defined Scientific attitude as a set of emotionally toned ideas about science and scientific methods and related directly or indirectly to a course of action.

Anusekar (1995)\textsuperscript{289} in his Instrument of Scientific attitude Scale has defined scientific attitude as open mindedness, a desire for accurate knowledge confidence in procedures for seeking knowledge and the expectation that the solution of the problem will come through the use of verified knowledge.

Most of the above mentioned instruments are based on a fairly explicit rationale. However, each one suffers from one or more of the following shortcomings; the definition of the attitudes are too general; there is tendency to lump together several dimensions of science under the caption of attitude (e.g. interest, attitudes and values are grouped with processes involved in scientific inquiry), the scales do not discriminate between the effective and cognitive components involved in attitude measurement; and the content of the scales do not adequately represent classroom situations and experiences.

Therefore, the dearth of suitable instrument to measure the scientific attitude of the students motivated the researcher to develop their own instrument to measure scientific attitude of the students.

\textsuperscript{288} N.Vaidya, “The Impact of Science Teaching”. Oxford and IBH
Identification of the Components of the Scientific Attitude Scale

The first step in the direction was to identify the different situations in the classroom environment wherein variations in the students’ scientific attitude were possible. Following nine components were identified on the basis of Srivastava’s (1980) study on scientific attitude and after reviewing the relevant survey literature and having discussed with school, college and university teachers in the field of science and test construction. Table 1 shows the components of scientific attitude scale to be included in the scale along with the number of items.

Table 3.3 : Components in the SAS and the number of Items

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Components</th>
<th>No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Curiosity</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Open-Mindedness</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>Faith in Scientific Method</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Cause and Effect Relationship</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Critical Mindedness</td>
<td>06</td>
</tr>
<tr>
<td>6</td>
<td>Seeks Evidence</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>Objectivity</td>
<td>18</td>
</tr>
<tr>
<td>8</td>
<td>Suspended Judgement</td>
<td>09</td>
</tr>
<tr>
<td>9</td>
<td>Aversion to Superstition</td>
<td>11</td>
</tr>
</tbody>
</table>

|                             | N=122 |

Tryout of the Scale by a Panel of Judges

A total number of 122 items concerning the scientific attitude were originally constructed and presented to a panel of 6 judges (science lectures teaching in schools and colleges) for determining the suitability

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of the item in a particular component, language and vagueness and ambiguity of the item if any in the construction of item. On the basis of the judgment of panel of judges 29 items/ statements were deleted from all the components of the scales.

**Reliability of the Scale**

As the scale being heterogeneous and items having been arranged logically, the two halves could not have been identical. Therefore, test-retest method of reliability was found to be more suitable for the scale. The reliability study of the scale was conducted over a sample of 30 students. The second administration of the test of correlation was given after a month. The product moment co-efficient of correlation for the two scores were computed. The coefficient of correlation between two test scores was found to be 0.70. This coefficient of correlation is fairly high, which testifies the soundness of the scale.

**Validity of the Scale**

The purpose of the present investigation and the nature of the items restricted the use of every exhaustive statistical technique to validate the test. Factorial validity could not be ascertained as in general each concept was represented by only few items.

The scale was validated against the criterion of “content validity”. The content validity is concerned with the adequacy of sampling of a specified universe of content.

To determine content validity, the scale items and a list of outcomes were given to the panel consisting of four experts in subject matter and three experts in test construction.

The panel was asked to identify which test items corresponded to which outcomes. The experts agreed 92 % with the investigators on the
assignment of scale items. This concurrence was taken as evidence of content validity.


**Introduction**

Nature of intelligence has been a great psychological scandal, Psychologist try to measure intelligence and teachers try to cultivate intelligence but none seems to know precisely what intelligence is. Intelligence is a behaviour determining attribute. It is an inference drawn from the behaviour. Difference scholars have defined intelligence in difference ways. Terman’s said that an individual is intelligent in proportion to his ability to carry an abstract thinking. According to Thorndike intelligent consists in the capacity for mere association or connection. For Colvin, intelligence was the ability to learn to adjust oneself to the environment. Pinter thought that it is the ability to adapt oneself adequately to relatively new situation in life .According to Thurstone, intelligence is the capacity to make impulses focal at their early unfinished stage of formation. Binet hold that intelligence involves the tendency to take and maintain a definite direction, the capacity to make adaptations for the purpose of attaining a desired end and the power of self criticism. For Bukingham intelligence is the ability to learn. Wechler said, Intelligence is the global capacity to act purposefully, to think rationally and to deal effectively with the environment. According to Rex Knight, “Intelligence is the capacity for relational, constructive thinking directed to attainment of some end.

Intelligence is not unitary but it comprises abilities. Several efforts have been made to construct verbal tests for measuring intelligence of
Hindi seeking students. M.C. Joshi’s test has item of seven types- synonym, antonym numerical classification best answer, reasoning and analogy. It was for students of class VIII to XII classes. Prayag Mehta’s test had 60 items of ten types viz. logical selection, number series, classification analogy, best answer, informations , disarranged sentences, absurdities, inference, and arithmetical reasoning. It was meant for 12-14 year old students, S.S. Jalota’s test consisted of 100 items of seven types namely-, classification, number series, analogies, best answer, reasoning, similar and opposites. It was meant for VIII to X class students.

P.N. Mehotra constructed five verbal tests, namely – analogy test, number series test, classification test, vocabulary test and reasoning test, for 11-17 years old students. Patel’s test for 14-16 year old students had items related to series, analogy, synthesis and classification. Authors experienced the need for a suitable test for measuring the intelligence of students studying and post graduate classes.

**Preparation of Items**

To begin with, several items were prepared and subjected to initial screening by the authors. Consequently, 25 vocabulary, (word meaning), 27 analogy, 30 classification, 25 number series syllogistic reasoning, 25 code transformation questions were retained for inclusion in the try out form.

**Try-out and item analysis**

The try out form of the TGI was administered to 66 B.A., 28 B.sc and 16 M.A. Students studying in two degree colleges and two university departments at Allahabad. Item analysis was done by calculating difficulty value and discrimination index for every item belonging to a particular subject. No time limit was set for try out. For item analysis, 30
students were selected from either end of the answer sheet arranged in descending order of scores on a particular subtest. 10 items were selected for inclusion in each subtest of TGI. The difficulty values of these items ranged from 20 to 73 while the discrimination index ranged from 20 to 85. The selected items were arranged in increasing order of difficulty. Thus, items were selected.

**Administration**

The investigator went through the instruction printed on the test booklet and read the instructions loudly and ask the students (sample) to read the instructions themselves. Students were asked to get their difficulties removed before them to start their work. Time limit for every test is of four minutes and it is strictly adhered by the students. Students were not be allowed to open the fourth page until the investigator asked them to do so. The investigator move around in the room when examinees are responding to various items to check whether students are doing their work seriously and sincerely.

**Scoring**

Answer key should be placed on the answer sheets. Correct answer was marked by putting the (√) mark. Number of tick mark for every subtest was counted and then these sub-scores should be added together to get a composite score.

**Data Collection**

Both the tests were administered on the same day with a provision for assured break between the tests. While administering the tests instructions were read-out by the investigator and the illustrative examples were explained in depth to the students and all the doubts were clarified.
The performance of the students in Science Subject among Higher Secondary School Leaving Certificate Examination conducted by MBOSE was taken as the data for Academic Achievement in Science Subjects. The marks obtained by the subjects in the sample were taken from the School Records/Mark Sheets.

(v) **Statistical Techniques Used**

The present study has used the following statistical techniques.

(a) **Mean**

The Mean was used in the study because it is the most useful of all statistical measures, for, in addition to the information that it provides, it is the base from which many other important measures are computed.

(b) **Standard Deviation (SD)**

SD has been used as a measure of spread or dispersion of scores in a distribution.

(c) **Percentage**

Percentage has been used in the study in order to get better information about the proportion of sample.

(d) **Pearson’s Co-efficient of Correlation**

Pearson’s Co-efficient of Correlation is used in the study so as to examine the relationship of one variable to another

(e) **‘t’ test**

‘t’ test was used in the present study so that the significance of the difference between two means can be found out.
3.3 Conclusion

Each method and procedure used in the present study has been explained in a clear and lucid manner in this chapter. The analysis and findings shall be given in the next chapter.