CHAPTER-III

RESEARCH DESIGN

- Introduction
- Sample
- Tools Used
- Procedure for Data Collection
- Statistical Analysis
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RESEARCH DESIGN

3.0 INTRODUCTION

A researcher before formulating a research design should contemplate on it thoroughly keeping in view the demands of the selected problem. An objectively and suitably designed technique for the completion of various research steps is the basic requirement for a research problem. Thus a research plan is specifically conceived and executed to bring empirical evidence. The design of the research is the actual blueprint of ensuring research. A well-conceived design, adequately planned and executed, helps greatly in permitting to rely both on observations and inferences.

Research design set up the frame-work for 'adequate' tests of the relations among variables. Design tells us, in a sense, what observations to make, how to make them and how to analyze the quantitative representations of the observations. A design tells us what type of statistical analysis to use. Finally, an adequate design outlines possible conclusions to be drawn from the statistical analysis keeping in view the requirements for an adequate design as discussed above, the present investigator formulated an appropriate design for the purpose of the present study. The details about the same are given as under:

3.1 SAMPLE:

600 teachers teaching Mathematics to 11th and 12th classes in Senior Secondary Schools of Haryana State have been serving as the
population for the present study. Out of these, 200 teachers were selected randomly. For this purpose the names of all the Mathematics teachers were arranged alphabetically, thereafter from the list the sample of teachers was selected by using random table. Thus out of 600 Mathematics teachers, 200 teachers were selected randomly for the final sample. Besides this 6000 students of the Senior Secondary school participated in the study.

Some background factors like sex, and some academic factors like academic qualifications and length of service were controlled. The following criteria was fixed for the selection of sample teachers for the present study:

a) Male Mathematics teachers were selected.

b) Only those Mathematics teachers were selected who were called lecturers in the concerned subject with B.Ed.

c) Only those Mathematics teachers were taken who had put in a minimum of two years of service as lecturer at the +2 stage.

3.2 TOOLS USED

The following tools were used for the collection of data for the present study:

(A) Tool used for identification of high and low competency Mathematics teachers.

1. General Teaching Competency Scale by Passi and Lalita.
(B) Observation of Mathematics Teachers-verbal and non-verbal behaviour.

1. Flanders Interaction Analysis Category System (FIACS).
2. A check list to measure the Non-Verbal Teachers’ Behaviour of Mathematics teachers was developed by the investigator.

The investigator employed a number of tools for the present study. Some of these tools were specially constructed and developed for the study. For observation of teachers verbal behaviour in the classroom an observation schedule based on Flanders Interaction Analysis Category System (FIACS) was employed. Whereas for the measurement of non-verbal aspect of teacher behaviour in the classroom a self constructed checklist was administered. For recording judgements of the teachers in the classroom an interview schedule prepared by the investigator was administered.

**Flanders Interaction Analysis Category System (FIACS)**

An observation schedule based on Flanders Interaction Analysis Category System was used for observing teachers verbal behaviour in the classroom. The observation schedule on the basis of Flanders ten categories was prepared by the present investigator. On the margins of the schedule sufficient explanation was given for each category. In the middle appropriate space has been left for recording the occurrence of these ten categories during the run of the classroom teaching.

a.) Try-out

The observation schedule was tried out on a small group of teachers (N=50). The two observers recorded classroom interaction of each
teacher in the classroom. The inter-observer reliability for the observation schedule prepared on the basis of FIACS was worked out using Scott's method. The results are given as under:

<table>
<thead>
<tr>
<th>Category</th>
<th>A Observer Ratio</th>
<th>f</th>
<th>B Observer Ratio</th>
<th>f</th>
<th>Percentage Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepts feeling</td>
<td>0.005</td>
<td>2</td>
<td>0.01</td>
<td>4</td>
<td>0.464</td>
</tr>
<tr>
<td>Praises or encourages</td>
<td>0.029</td>
<td>11</td>
<td>0.032</td>
<td>13</td>
<td>0.536</td>
</tr>
<tr>
<td>Accepts or uses ideas of students</td>
<td>0.002</td>
<td>1</td>
<td>0.005</td>
<td>2</td>
<td>0.232</td>
</tr>
<tr>
<td>Asks questions</td>
<td>0.088</td>
<td>33</td>
<td>0.097</td>
<td>39</td>
<td>0.903</td>
</tr>
<tr>
<td>Lecturing</td>
<td>0.073</td>
<td>273</td>
<td>0.702</td>
<td>281</td>
<td>2.94</td>
</tr>
<tr>
<td>Giving</td>
<td>0.010</td>
<td>4</td>
<td>0.012</td>
<td>5</td>
<td>1.175</td>
</tr>
<tr>
<td>Criticizing or justifying authority</td>
<td>0.002</td>
<td>1</td>
<td>0.002</td>
<td>1</td>
<td>0.018</td>
</tr>
<tr>
<td>Student-talk response</td>
<td>0.067</td>
<td>25</td>
<td>0.067</td>
<td>27</td>
<td>0.48</td>
</tr>
<tr>
<td>Student-talk initiation</td>
<td>0.013</td>
<td>5</td>
<td>0.017</td>
<td>7</td>
<td>0.410</td>
</tr>
<tr>
<td>Silence or confusion</td>
<td>0.048</td>
<td>18</td>
<td>0.052</td>
<td>21</td>
<td>0.225</td>
</tr>
<tr>
<td>N</td>
<td>0.337</td>
<td>373</td>
<td>0.996</td>
<td>400</td>
<td>5.952</td>
</tr>
</tbody>
</table>

N = 373, 337 = 100.00, 400.996 = 100.035

Rate = 0.059

\[ P_o = 1.00 - \text{disagreement} \]
\[ P_o = 1.00 - 0.59 = 0.941 \]

\[ r = \frac{P_o - P_e}{1 - P_e} \]

\[ r = \frac{0.941 - 0.012}{1.00 - 0.012} = 0.940 \]
Check List for Recording of Non-Verbal Teacher Behaviour

a) Pooling of items

In order to decide about areas to be covered in the check list and also with the purpose of pooling the items, a group of 100 students reading in 11th and 12th classes were contacted and requested to give details regarding non-talking aspect of teacher behaviour with in classroom situation. The students responded and gave information regarding various activities of non-verbal teacher behaviour that usually take place during the run of the class. As such the statement of activities was collected and was pooled. Out of this pool which contained as many as 39 items, 29 items were selected on the basis of frequency. With these frequently repeated 29 items, the initial format of the check list was formulated.

b. Try-out

The initial format was tried out on a small group of teachers (N=50). The two observers recorded the non-verbal behaviour of each teacher in the classroom. In the light of inter-observer agreement the items were redrafted and revised. As many as 13 items were dropped and the final format thus consisted of 16 items.
Some of the items are reproduced as under:

1. Blushes
2. Kicks the students, the chairs, the desks.
3. Slappes the students
4. Snatches papers from the students
5. Gets irritated easily
6. Turns pale
7. Yells
8. Smoke inside the classroom.
9. Smiles

Interview Schedule for Recording Judgements of the Teachers

a) Pooling of items

In order to decide about the items to be covered in the interview schedule regarding judgements of teachers, items regarding judgements were asked both from the students and teachers. 100 students and 50 senior secondary school teachers were requested to identify the areas of
school activities in which the teachers give their judgements. The areas identified included; Impartiality, Guidance and advice, honesty, nepotism, favouritism, student affairs, Interaction, Individual difference and student needs. Items on these areas were also collected and pooled. Out of this pool which contained as many as 30 items, 14 items were selected on the basis of frequency. With these frequently repeated 14 items the initial format of the interview schedule for assessment of judgements in respect of teachers was formed.

b) Tryout:

The initial format was tried out on a sample of 100 students in order to get information regarding the judgements of teachers. In the light of students' responses the items were redrafted and revised and the final format consisting of 14 items was finalized.

3.3 PROCEDURE FOR DATA COLLECTION

The present investigation was undertaken in two phases:

PHASE-I

In Phase I high and low competency Mathematics teachers were identified with the help of General Teaching Competency Scale. It was administered on 200 Mathematics teachers. For identification of high and low competency Mathematics teachers on the basis of criterion measures an extreme group technique in terms of upper 25% and lower 25% was employed. Thus, the two groups, the upper and lower, which served as
the final sample for the present study were identified. Only those cases were considered for the present investigation which figure in all the groups identified on the basis of individual criterion measure.

PHASE-II

In Phase II, after identifying 50 Mathematics teachers in each group, the high and low competency Mathematics teachers were studied for their verbal and non-verbal aspects of teaching behaviour and their judgments with respect to rewards, punishments, pupil needs, individual differences and pupil control. For this purpose observation schedule based on Flanders's Interaction Analysis Category System (FIACS) was administered on the sample teachers. A checklist was used to get the ratings for the sample teachers on various dimensions of non-verbal teaching behaviour. The sample students were interviewed on the basis of interview schedule prepared for the purpose of present study.

The details of various steps taken in this direction are reported as under:

a) The procedure of observation:

The present investigator along with another colleague had to familiarize himself with the techniques of observation, coding of categories, decoding, preparation of matrices and estimation of behavioural ratios. The inter-observer reliability of the observation was estimated which came out to be .94. At the time of recording observations the observers sat comfortably in the classroom to see conveniently and hear the teacher and the students. The observations were made in actual
classroom situation. The observations were made for a fifteen-minute time installment. Each teacher was observed by two trained observers and the matrix was prepared on the basis of average of the ratings given by the two observers.

b) Preparation of Interaction analysis Matrix

Two observations of each teacher in the high and low competence mathematics groups were recorded with a time gap of 7 days. Observation tallies were recorded and entered into 10x10 matrix. The observation matrix of each teacher was prepared by taking the following steps:

Step I: Beginning and closing the observation:

Added 10 in the beginning and in the end of the series of observation. (If in the beginning and at the end the category was other than ten).

Step II: Forming pairs:

In forming pairs of observation, such numbers were used twice, excepting the first and the last observations. The second number of the first pair formed first number of the second number pair, second number of the second pairs formed first number of the third pair and so on. The pairs were recorded as under:
Step III: Tabulating Interaction Analysis Matrix:

The first sequence pair, 10-5 would be tallied in the cell located at the intersection of 10th row and 5th column, the next pair 5-4 will be tallied in the cell located at the intersection of 5th row and 4th column, and so on so forth. Each pair of numbers overlaps with the previous pair and each except the first and the last, is used twice. The procedure is illustrated in the following Table-3.
The matrix table may be developed in such a way that the rows and columns for categories are proportionately sized e.g., row and column for category 5 may be kept biggest, rows and columns for categories 4, 6, and 8 may be relatively smaller and for the rest of the categories still small. The total in rows and columns should be identical. It will provide as the first check. A separate matrix is prepared for each specific lesson or major activity. Matrices are more meaningful when they represent a single type
of activity of work. It is also possible to pool the matrices. Matrices are pooled cell wise. There will be 100 cells in a 10x10 matrix. The pooled matrix is called the master matrix or mileage matrix. These are required when the nature of classroom interaction of a particular type of teachers is the subject of our study. If two or more observations of a teacher have been taken for lessons in a particular subject, pooled matrix of these two or more lessons may depict the data of individual's aggregate performance.

c) Formula for working out behavioural ratios:

Various classroom behavioural ratios were computed from the 10x10 interaction matrix using the operations shown against each:

Teacher talk (TT) = \[
\frac{(\text{Categories } 1+2+3+4+5+6+7) \times 100}{\text{Total of all categories}}
\]

Pupil talk (PT) = \[
\frac{(\text{Categories } 8+9) \times 100}{\text{Total of all categories}}
\]

Silence or Confusion (SC) = \[
\frac{(\text{Categories } 10) \times 100}{\text{Total of all categories}}
\]

Teacher Question Ratio (TRQ) = \[
\frac{(\text{Categories } 4) \times 100}{\text{Categories } 4+5}
\]

Teacher Response Ratio (TRR) = \[
\frac{(\text{Categories } 1+2+3) \times 100}{\text{Categories } 1+2+3+6+7}
\]

Pupil initiative Ratio (PIR) = \[
\frac{(\text{Categories } 9) \times 100}{\text{Categories } 8+9}
\]
Content Cross Ratio (CCR) = \frac{\text{(Categories 4+5) x 100}}{\text{Total of all categories}}

Vicious Circle (VC) = \frac{(6-6)+(6-7)+(7-6)+(7-7)}{N}

Instantaneous Teacher Quest. = \frac{\text{Cells \{(8-4) + (9-4)\} x 100}}{\text{Cells \{(8-4)+(8-5)+(9-4)+(9-5)\}}}

\begin{align*}
\text{Instantaneous Teacher Response} &= \frac{\{(8-1)+(8-2)+(8-3)+(8-6)+(8-7)+(9-1) \\
&\quad +(9-2)+(9-3)+(9-6)+(9-7)\}x100}{\{(8-1)+(8-2)+(8-3)+(8-6)+(8-7)+(9-1) \\
&\quad +(9-2)+(9-3)+(9-6)+(9-7)\}}
\end{align*}

Besides this the non-verbal aspects of teacher behaviour and judgements with respect to rewards, punishment, pupil needs, individual difference and pupil control of these teachers were also recorded with the help of checklist and interview schedule constructed for this purpose.

In order to accomplish the objectives of the present study and also with the purpose of testing the hypotheses, the data collected through various data gathering devices were statistically analyzed.

3.4 STATISTICAL ANALYSIS

In order to test the Hypotheses of the present study the data gathered was statistically analysed with the help of appropriate statistical technique such as percentage, significance of difference between the various indices/ratios etc. In order to fulfill the objectives of the present study Percentage %, C R and 't'-test were employed for analysing the data.