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CHAPTER IV

PLANNING AND PROCEDURE

4.1 Introduction

The foregoing chapters dealt profusely on conversation and metalinguistic abilities of children. Many researches pertaining to these variables have been examined critically. The present problem of the research deals with the impact of metalinguistic abilities upon the reading of first grade children. The conservation ability is found to be a precursor of metalinguistic abilities in the children. It is held that the conservation ability determines the extent and nature of metalinguistic abilities in children. Thus, the conservation and metalinguistic abilities are hypothesized to have prominent impact upon the reading in children.

Thus, there are following independent variables isolated for this research:

(1) Conservation ability

(2) Metalinguistic abilities
   (a) Phonological awareness
   (b) Word awareness
(c) Syntactic awareness
(d) Pragmatic awareness
(3) Sex of the children
(4) Parents' educational level

The sex and the parent's education have also been hypothesized to have impact on metalinguistic abilities and the beginning reading.

4.2 Phases of Research

Looking to the above, there would be two exploratory studies on

(1) Conservation, and
(2) Metalinguistic abilities.

In the first exploratory study, the conservation ability of the pupils would be examined in context of parents' education, SES and sex.

In this study, conservation ability would act as dependent or criterion score whereas SES, sex and parents' education would act as independent variable.

In the second phase, metalinguistic abilities of the children would be explored and their relation with
conservation ability would be examined. The measurement of these variables would be taken up over two points of time, viz. at the time of admitting and at the end of the first grade.

The purpose of this study would be

(1) to find out inter-relationships of these variables.
(2) to ascertain whether conservation is a causative variable for metalinguistic ability.

The third phase would examine the reading achievement of the pupils in the context of metalinguistic ability, conservation ability and sex of the pupils of first grade.

4.3 Formulation of Null Hypotheses

The following null hypotheses would be enumerated phase-wise.

4.3.1 Hypotheses of Phase-I

(1) There is no significant difference in the mean scores of the conservation ability (CA) of the pupils having high and low SES of their parents.
(2) There is no significant difference in the mean scores of the conservation ability (CA) of the pupils having high and low levels of their parents' education.

(3) There is no significant difference in the mean scores of the conservation ability (CA) of boys and girls.

(4) There is no significant interaction between/among the independent variables in producing CA.

4.3.2 Hypotheses of Phase-II

(1) There is no significant correlation between Phonological awareness (PA) and Conservation ability (CA) of the pupils.

(2) There is no significant correlation between Word awareness (WA) and Conservation ability (CA) of the pupils.

(3) There is no significant correlation between Syntactic awareness (SA) and Conservation ability (CA) of the pupils.

(4) There is no significant correlation between Pragmatic awareness (PrA) and Conservation ability (CA) of the pupils.
There is no significant 'cross lag' correlation between

(i) PA and CA
(ii) WA and CA
(iii) SA and CA
(iv) PrA and CA

4.3.3 Hypotheses of Phase-III

(1) There is no significant mean difference in Reading Achievement Scores (RAS) of the pupils having high and low metalinguistic ability.

(2) There is no significant mean difference in Reading Achievement Scores (RAS) of the pupils having high and low conservation ability.

(3) There is no significant mean difference in Reading Achievement Scores (RAS), of the boys and girls.

(4) There is no significant interaction between/among the independent variables in producing RAS in the pupils.

Thus, there are following variables and their levels and their measurement techniques given in Table 4.1.
Table 4.1: Variables, Their Levels and Measuring Tools

<table>
<thead>
<tr>
<th>Phase</th>
<th>Variables</th>
<th>Nature of variables</th>
<th>Levels</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1. Parent’s SES A</td>
<td>Independent</td>
<td>A&lt;sub&gt;1&lt;/sub&gt;- High</td>
<td>SES Inventory</td>
</tr>
<tr>
<td></td>
<td>2. Parent’s Education B</td>
<td>&quot;</td>
<td>B&lt;sub&gt;1&lt;/sub&gt;- High</td>
<td>Data sheet of parent’s education</td>
</tr>
<tr>
<td></td>
<td>3. Sex C</td>
<td>&quot;</td>
<td>C&lt;sub&gt;1&lt;/sub&gt;- Boys</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Conservation Ability</td>
<td>Dependent</td>
<td>&quot;</td>
<td>Piagetian Tasks of Conservation</td>
</tr>
<tr>
<td>II</td>
<td>1. Conservation Ability A</td>
<td>Independent</td>
<td>A&lt;sub&gt;1&lt;/sub&gt;- High</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td>2. Phonological Awareness B</td>
<td>Dependent</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Word Awareness C</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Teacher made tool of</td>
</tr>
<tr>
<td></td>
<td>4. Syntactic Awareness D</td>
<td>&quot;</td>
<td>&quot;</td>
<td>metalinguistic abilities</td>
</tr>
<tr>
<td></td>
<td>5. Pragmatic Awareness E</td>
<td>&quot;</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>1. Metalinguistic Ability A</td>
<td>Independent</td>
<td>A&lt;sub&gt;1&lt;/sub&gt;- High</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td>2. Conservation Ability B</td>
<td>&quot;</td>
<td>B&lt;sub&gt;1&lt;/sub&gt;- High</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td>3. Sex C</td>
<td>&quot;</td>
<td>C&lt;sub&gt;1&lt;/sub&gt;- Boys</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Reading Achievement</td>
<td>Dependent</td>
<td>&quot;</td>
<td>Teacher made test</td>
</tr>
</tbody>
</table>
In nutshell, the following hypotheses would be examined which are mentioned in Table 4.2.

Table 4.2: Types of Hypotheses and Their Number

<table>
<thead>
<tr>
<th>Types of Hypotheses</th>
<th>No. of Hypotheses in Phase I</th>
<th>II</th>
<th>III</th>
<th>Total Number of Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>First order Interactions</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Second order Interaction</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Causative (cross lag)</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

Thus there would be 22 null hypotheses to be examined in this research.

4.4 Variables and Their Measurement

4.4.1 Parent's SES and Its Measurement

The cultural or social background of the home has been found to bear a relationship to reading readiness and reading progress. This broad group of factors, referred to as "home background" includes a number of environmental aspects, some more important than others,
but all affecting the total experience of the child brings to the reading situation.

"Home background" includes the following:

1. Economic conditions, such as relate to income of the family, size of house, sufficiency and regularity of meals and sleep, etc.

2. Opportunity for play and for social experiences of different kinds - these are linked with growth of concepts and vocabulary.

3. Nature and amount of speech and language patterns of children, particularly as they are influenced by the talk of their parents.

4. Attitudes towards reading and writing, the amount of reading done in the home, and the availability of books of varying levels of difficulty.

5. Quality of family life in terms of inter-parental relationships.

Such aspects of the home background determine the quality of the experience the child brings to the reading situation, and experience in the basic pre-requisite for reading.
Research on these aspects of home background is needed. So the investigator has chosen socio-economic status (SES) as a variable which is closely connected with the five aspects and their relationships with reading ability.

It is generally seen that pupils having high reading ability come from high socio-economic strata.

The SES would act as independent variable operating at two levels of high and low SES in this research.

To decide the SES level, the investigator had taken into consideration the income of the parents. After all, the income of the parents decides what the home environment would be received by the children at home. Income and social status go hand in hand. The income of the parents was taken but here the median value of the income was not considered as cut-off score to divide high and low levels of SES. The investigator took the ceiling of taxable income decided by the Central Government. At present, Rs. 30,000/- + is a taxable income. Hence, the parents whose income was above Rs.30,001/- was categorized as having high SES while those having less than 30,001/- was categorized as low SES. It was
hypothesized that children of high SES would have
more conservation ability than those having low SES.

4.4.2 Parent's Educational Level and Its Measurement

A person may be rich yet illiterate. Illiteracy
or lack of adequate education of the parents play a
dominant role on the child rearing practices. The educated
mother leaves a lasting impression over the child's
personality and its subsequent education in school and
college. That is why investigator has separated the
variable of parent's educational level from SES variable.
It is presumed that a child coming from high educational
level of its parents would show high conservation ability
and definite positive trend in reading progress as compared
to that of low parental educational level.

Measurement of Parental Educational Level (P'Ed.)

To decide the P'Ed. level, she had used a question-
naire of tabular form wherein the guardian indicates
the proper place where he/his wife stand in the educational
institution. A year spent in the institution successfully
would be given one credit, e.g. if a mother has passed
sixth grade of primary school and the father has passed
S.S.C.E., then the mother would get 6 credits while the father would get 11 credits, thus forming 17 \((6+11)\) as the family literacy scores.

The family literacy scores of the parents of the pupils would give a distribution of scores from which a median value would be computed which would act as cut off score to dichotomize the variable into high and low levels. \(^2\)

4.4.3 Sex

The variable of sex would operate at two levels - Boys and Girls. This bifurcation was needed looking to the differences in psychological traits exhibited by them, to reduce the variability of scores in the randomized block research design.

4.4.4 Conservation Ability and Its Measurement

The following Piagetian tasks \(^3\) were selected for measuring conservation concept of number, volume, length and weight. They are described below:
(a) **Description of Conservation Tasks**

(1) The first task used was conservation of number.

The child was asked to select those coloured cubes which are equal in number.

After she or he selected equal number of cubes differing in colours cubes were stacked one on top of the other while the black cubes were left in row.

The child was then asked if there were more red cubes, more black cubes, or if the numbers of black and red cubes were equal.

If he or she reported that the numbers are equal, she conserved number.

In each of the four tasks, the child was asked why she gave her response.

(2) The second task used was the conservation of liquid (volume).

The materials that were used were two identical beakers, a cylinder, a sauce and water.

The same amount of water was poured into the two identical beakers; in sauce and cylinder water was also poured.
If the child selected two beakers having same amount of water, then the water was poured into a taller, thinner cylinder; he was then asked whether there was more water, less water, or if the amount is equal, and why.

The child was credited with conservation of volume if he stated that the water poured into the taller container (cylinder) was equal to the water in the beaker.

(3) The third conservation task was that of length.

Materials used were four pieces of string measuring varying length. The child was asked to select two strings having equal length. If the child selected two strings of equal pieces, then one string was transformed into circle.

He was then asked whether a line is longer, circle is longer or if both were equal in length and why?

The child was credited with conservation of length if he stated that the string made circular was of equal length to the string having a straight line.

(4) The last task was conservation of weight.

Two clay balls of equal amounts were selected by the child, who was allowed to add or subtract from the balls until he agreed that each ball weighed the same.
When she agreed to this, one ball was taken from him, and flattened into a cake.

He was then asked if there were more clay in the ball, in the flattened cake, or if the amounts still remained the same.

If he responded that they were still the same, conservation of weight occurred.

(b) Scoring Procedure of Conservation Tasks

Each task had four types of questions in a sequence.  

1. Identification
2. Selection of equality or equivalence
3. Equivalence after change
4. Explanation

If he can identify the object/objects, he is credited one mark ...... 1.

If he can select equivalent objects from among many objects, he is credited one mark ...... 1.

Then the object is transformed.

After transformation, if the pupil can again show the equivalence, he is given two marks ...... 2
If he can give proper explanation for equivalence he is given two marks ....... 2

Total marks ....... 6

Thus each task has six marks. For all correct answers a pupil would get six marks. There are in all four tasks pertaining to number (N), volume (V), length (L) and weight (W). The range of marks would be 0 to 24.

The details of the conservation tasks are given in Table 4.3 below:
<table>
<thead>
<tr>
<th>Name of task</th>
<th>Cognitive Ability</th>
<th>Materials used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation of Number</td>
<td>Conservation</td>
<td>19 wooden blocks of following description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 blocks of red</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 blocks of black</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 blocks of white</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 blocks of green</td>
</tr>
<tr>
<td>Conservation of Liquid (Volume)</td>
<td>Concrete reasoning</td>
<td>4 glass utensils of following description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 beakers of equal size</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 sauce</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 cylinder water</td>
</tr>
<tr>
<td>Conservation of Length</td>
<td>Conservation</td>
<td>4 pieces of string of following description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 pieces of 8&quot; long string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 piece of 4&quot; long string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 piece of 12&quot; long string</td>
</tr>
<tr>
<td>Conservation of Weight</td>
<td>Conservation</td>
<td>4 balls of clay of following description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 balls of clay of 100 gm weight</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ball of clay 200 gm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ball of clay 50 gm</td>
</tr>
</tbody>
</table>

4.4.5 Metalinguistic Abilities and Their Measurements

These tests are to be prepared by the investigator using scientific techniques. The detail procedure would be described in the next chapter. Here only the names and the content would be described.
(1) Phonological awareness of the children could be ascertained by administering phonological awareness test. The test consists of 22 words arranged according to their difficulty values. The word has to be separated into different pronunciations by tapping the number of sounds on the desk. The stimulus word is spoken by the investigator. Each correct response is credited one score. Thus the maximum marks would be 22. The range of scores would be 0-22.

(2) Word awareness test consists of 22 words. Although word awareness also develops during middle childhood and appears to be related to beginning reading achievement, there is no need to treat it separately from phonological awareness test. But the present investigator constructed the test that is different from phonological awareness test. On phonological test, the pupil has to dissociate each sound and tap sounds of the words.

In word awareness test, the pupil has to pronounce the word after deleting a sound uttered by the investigator.

(3) Syntactic awareness test consists of 22 sentences. The purpose of its inclusion in metalinguistic test battery is to know the role of syntactic awareness in learning to read.
Syntactic awareness was assessed by an oral correction task. The children were asked to correct sentences of three or four words in length that contained word-order violations. A total of 22 items were presented to each child. Credit was given to correct response. Prompting of any kind was not allowed. The maximum score was 22 and the range would be 0-22.

(4) Pragmatic awareness test, the fourth kind of metalinguistic skill, may influence reading development by enabling children to monitor their comprehension of text at the intersentence level. Good readers, for example, are better able to detect between-sentence inconsistencies in written text than poor readers.

Children's pragmatic awareness was assessed by their ability to detect intersentence inconsistencies in passages presented orally.

The first sentence of each passage is a neutral introductory sentence and the second sentence corresponds to the first sentence. The third sentence was logically consistent or inconsistent with the former two sentences.

Eleven story frames were generated. The test items run like the following:

There was a girl.
She slept at night in her home.
She saw the sun in the sky.
Following the presentation of three practice stories with corrective feedback, the children were tested on 11 stories. After each story they were asked to say whether it was sensible or not and then to justify their response.

Scoring was based both on judgement and on the explanation. Each story carries two marks. Maximum score of the test is 22.

Thus, the four tests of metalinguistic abilities were administered to the children individually by the investigator herself and three trained women teachers.

The full details regarding construction and standardization have been given in the next chapter.

4.4.6 Reading Achievement

This was tested by administering a reading achievement test prepared by the investigator at the end of the year. It consists of 22 words which are to be read by the children.

The test consisted of the following subtests.
(1) Reading word decoding test assessed the children's ability to recognize real words. The material consisted of 8 word list, the list was in order of increasing difficulty. Total score was 8.

(2) Pseudo word decoding test consists of 8 words. These consisted of synthetic words that were constructed to correspond to the rules of Gujarati Orthography. Before being asked to read the synthetic words aloud, the children were told that the items were not real words and had no meaning, but they could be pronounced like Gujarati words. The children continued reading the list aloud until they had failed to respond correctly at least half of the items in a list. The one credit was awarded to the right response. Total score was 8.

(3) Reading comprehension subtest: The material for the reading comprehension subtest consisted of well-formed story which evoked interest and motivation of the children when they read. The story was constructed according to the principles of story grammar. The children were presented the story and they were asked to read it aloud. If they were able to read the story within a specified period of time (130 seconds)
they were asked to retell as much of the story as they could. After the children finished the free-recall task, any element that was not adequately recalled was then probed with corresponding questions. The total marks would be six.

The marks of the Reading Achievement test would be compounded by the addition of three subtests. The maximum score would be 22.

4.5 Time Allowances for Test Administration

Conservation test, Metalinguistic test took a lot of time because these tests were to be administered individually. Though the time was kept flexible looking to the age of the children, the following timings of the tests would only give an estimation how difficult was the work.
Table 4.4: Time Allowances of Different Tests

<table>
<thead>
<tr>
<th>Name of the Test</th>
<th>Maximum Time Limit in minutes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Conservation Tasks</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>(2) Metalinguistic Ability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Phonological Awareness Test</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>(ii) Word Awareness Test</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>(iii) Syntactic Awareness Test</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>(iv) Pragmatic Awareness Test</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>(3) Reading Achievement Test</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>(i) Real Word Decoding</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>(ii) Pseudo Word Decoding</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>(iii) Reading Comprehension</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total 87 minutes</td>
</tr>
</tbody>
</table>

All the tests listed in Table 4.4 were given at the beginning of the year as well as at the end of the first grade.
4.6 Research Design and Statistical Models

The formulation of hypotheses for the research paves the way for designing the research. The concept of a single variable proved useful in some area but it failed to provide a sound approach to quasi experimental and experimentation in the behavioural sciences. Rarely, if ever, are human events the result of single causes. They are usually the result of the interaction of many variables, and an attempt to limit variables so that one can be isolated and observed proves impossible. R.A. Fisher's contribution have provided a much more effective way of conducting realistic experimentation in the behavioural sciences. His concept of achieving unbiased observation through random selection of subjects and his concept of analysis of variance (ANOVA) made possible the study of complex interactions through factorial designs, in which the influence of more than one independent variables upon dependent variables could be observed.5

For the first phase, the three independent variables of SES, Parent's education and Sex at two levels each have been incorporated to form 2x2x2 factorial design while the dependent variable is conservation ability of the children of the first grade.
The fixed-effect model of Analysis of Variance would be used because the levels of the independent variables are two extremes. The following structural score is postulated for the design:

\[ Y = u + A + B + C + AB + AC + BC + ABC + \text{Error} \]

where,

- \( Y \) = Expected mean score of conservation ability
- \( u \) = Group mean
- \( A \) = Effect due to SES
- \( B \) = Effect due to Parent's Education
- \( C \) = Effect due to Conservation ability

In order to have reliable and valid interpretations of the analysed data and to facilitate smooth computation, a uniform cell size of the factorial design would be kept.

For the 2nd phase, a random sample of 30 children would be selected. These children would be administered conservation tasks and metalinguistic ability tests at the beginning and end of the first grade.

A simple product-moment correlation coefficients would be calculated and the relationships between the variables.
(1) Conservation Ability (CA) and Phonological Awareness (PA)
(2) CA and Word Awareness (WA)
(3) CA and Syntactic Awareness (SA)
(4) CA and Pragmatic Awareness (PrA)

would be established.

As mentioned earlier conservation is the precursor to metalinguistic ability. In order to establish a causative influence of conservation ability upon metalinguistic ability and reading achievement, the investigator desires to use cross-lagged panel analysis. This technique has been used by many renowned investigators of the western countries. To quote from the "Journal of Educational Research - 1990 Vol. 83 (4):

"Cross-lagged panel analysis was one of the techniques used to examine causal relationships between measures of reading achievement. Because the analysis is a relatively new quasi-experimental technique, we provide a brief discussion of the major features of this method. Cook and Campbell (1979) reviewed the development of cross-lagged panel analysis and also discussed in detail its assumption, limitations, and interpretation. Kenny and Harackiewicz (1979) have recommended appropriate uses for cross-lagged analysis. The usefulness of this technique has been both criticized (Rogosa, 1980) and defended (Locasio, 1982) in the literature."
Logic of the analysis: Cross-lagged panel analysis involves measuring a panel of subjects on two or more variables at two or more points in time. The simplest form of the technique involves measuring two variables at two points in time. This results in four measures and six correlations.

Chart 1: Cross-Lagged and Background Correlations Between Two Variables (A and B) Measured at Two Time Periods (1 and 2) on the Same Sample
The correlations between the two different variables measured at the same time (r_{A_1B_1} and r_{A_2B_2}) are called synchronous correlations. The correlations between the same variable measured at different times (r_{A_1A_2} and r_{B_1B_2}) are called auto-correlations, and the correlations between the two different variables measured at two different times (r_{A_1B_2} and r_{B_1A_2}) are called cross-lagged correlations.

This analysis involves a comparison of the cross-lagged correlations. Comparing the relative size of the cross-lagged correlations can give an indication of possible causal relationships between the two variables measured. This inference is possible if we make the assumption that cause is temporally antecedent to effect. This assumption means that if A is a cause of B, then changes in A will produce changes in B, but only after enough time passes for the causal effect to occur. Hypothesized mediating events between A and B produce the time lag. Other things being equal, this causal relationship occurring over time will result in a correlation between A at Time 1 and B at Time 2 that is relatively larger than for B at Time 1 and A at Time 2.
For the third phase, reading achievement would act as dependent variable while metalinguistic ability (A), conservation ability (B) and sex (C) would be independent variables each acting at two levels.

Here also a fixed-effect model would be invoked and the structural score would be postulated as under:

\[ Y = u + A + B + C + AB + AC + BC + ABC + Error \]

where,

- \( u \) = Group mean
- \( A \) = Effect due to metalinguistic ability
- \( B \) = Effect due to conservation ability
- \( C \) = Effect due to sex

To locate the significance of means where more than two means are encountered, a Newmankeul's Sequence Range Test would be employed. This test is a robust test and it requires large difference between the pair of means of significance.

4.7 Sample

One glaring limitation of this research would be its sample size. Because it requires 6 tests to be administered individually and at two times and to those
children of 5-6 years of age. So the investigator at the outset of the research was fortunate in getting cooperations from trained teachers for administering and scoring of the tests. Still however, the sample size would be adequate but it will not be too big.

The sample of 148 pupils has been taken to guard against possible mortality of sample at second administration of the tests. The minimum sample required is 90 for this research.

The next chapter would deal with the procedure and technique of test construction.
References:


2. Ibid.


