CHAPTER - 4

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4.1 INTRODUCTION

The National Policy on Education (NPE) has recommended a child-centred and activity-based process of learning. The child as an individual has his needs, interest, abilities (motor, cognitive, etc.), divergent as well as convergent production, attitudes, etc. which must be taken into consideration while transacting the curriculum. The forces that move educational practices need to be moulded by increasing knowledge available about children's development.

So far as Indian tribal children are concerned, the few researches have been undertaken, no doubt, momentum has gained in 90's. The present investigator prestudied research literature pertaining to tribal children of India. It is her humble submission that no developmental study has ever been conducted on Gujarati Tribal Children (GTC). "The most common application of the developmental approach to research in education and the behavioral sciences occurs in the area of human development. Obviously educators must know something about human growth and development." The prime objective for undertaking this cross-sectional survey was to study the cognitive development of pupils of grades I to IV and explore relationship between a dependent/criterion variable (two different measures) and twelve independent/predictor variables.

In this study, not only cognitive ability tests (CogAT) for grades I and II - non-verbal type and grades III and IV - verbal type - were developed separately but also academic achievement tests (AAT) in three different subjects (Gujarati, Mathematics and Environment) for GTC of grades I to IV were also constructed using item analysis. These newly developed tools would now be immensely and instantly useful (of course, after standardising the tests) to those who are directly connected with educational uplift of GTC. One can be in a position to measure cognitive ability, Piagetian conservation tasks and academic achievement of tribal children of grades I to IV, and can evaluate the outcomes of government's unceasing efforts to bring forward this deprived class of people.
4.2 SELECTION OF THE PROBLEM

After a meticulous and detailed study of related literature, the investigator’s tentative research proposal needed to be converted into a clear, specific and manageable research problem. It should, then, be presented as a problem statement or a title of the study. It was arrived at as follows in a very concise and precise form:

“A Survey of the Selected Factors in a Tribal Community of the Gujarat State affecting the Cognitive Growth and Development of its Children”

4.3 OBJECTIVES OF THE STUDY

The research problem was to be translated into objectives and/or hypotheses so that the investigator could focus information gathering, identify possible solutions and expectations to her problem and could, then, gather the information needed to see if a given explanation was correct. The major objectives were:

1. To study the growth and development of GTC of Grades I to IV by CogAT as well as Piagetian Conservation Tasks (PiCT).

2. To study the relationship between CogAT as well as PiCT scores ($Y_1$ and $Y_2$) with a number of independent variable measures ($X_1$ to $X_{12}$).

Independent Variables taken up in this study were:

- $(X_1)$ intelligence
- $(X_2)$ visual recall - immediate and delayed
- $(X_3)$ number of siblings
- $(X_4)$ child’s birth order
- $(X_5)$ pupil’s inclination towards education
- $(X_6)$ pupil’s personality traits
- $(X_7)$ socio-economic status (SES) of parents
- $(X_8)$ educational qualifications of teachers
- $(X_9)$ educational experience of teachers
teacher's participation in academic developmental activities, attitude towards teaching profession, etc. (Interest in academic growth)

teacher's effectiveness in creating academic interest in pupils

academic achievement of pupils

Thus twelve independent variables were included in this study. The dependent variable was cognitive growth and development - it being studied by newly developed CogAT as well as well-known PiCT, the two different measures.

4.4 HYPOTHESES OF THE STUDY

The study undertaken was, no doubt, a survey research; hypotheses were, however, built in, as it was also a correlational study, using canonical analysis. The formulation of a well-thought-out set of hypotheses could be a major step on the road to an effective study. "Such hypotheses place clear and specific goals before the researcher and provide a basis for selecting relevant samples, dependent variables and research procedures to meet these goals".

The formulated hypotheses were:

1. There would be significant positive relationship among cognitive growth and development as measured by composite scores of four sub-tests of cognitive ability and some of the independent variables at 05 level.

2. There would be significant positive relationship among cognitive growth and development as measured by composite scores of seven Piagetian Conservation Tasks and some of the independent variables at 05 level.

3. The relationship of the same independent variable with the two measures of a dependent variable would not be of the same magnitude.
4.5 DEFINITIONS OF THE TERMS

TRIBAL COMMUNITY:

A tribe is generally described as a group of people characterized by a common and distinct name, a group sentiment, and a specific territory. It is endogamous and has common institutional agencies for maintaining order in the community. It follows its own magic and rituals along with other social, economic, political and cultural traditions. Each tribe has its own code of conduct and practices, common sexual and connubial taboos. It is generally underdeveloped economically and is regarded as backward in education and other aspects. In this study, school going children of grades I to IV were selected from different tribal areas as specified by the government of Gujarat.

SELECTED FACTORS:

There can be innumerable various factors affecting cognitive growth and development of children. In this study, twelve factors - variables - were taken into consideration. Variables are characteristics of persons, things, groups, etc. which can take on values. These values can be categorical or quantitative. In this study both types of values were used. Independent variables have already been enlisted in the section 4.3, as X₁ to X₁₂.

COGNITIVE GROWTH AND DEVELOPMENT:

As per C.V Good, "growth means increment or change toward a more mature or developed state, indistinguishable, in this sense, from development or learning."³ The same author quotes, "development is loosely used as synonymous with growth, but more often and correctly restricted to sequences involving qualitative changes or changes in quantitative relations among constituent elements or factors, whether with or without merely incremental growth."⁴ Taking into consideration both of these definitions, the present investigator was inclined to use the phrase "growth and development."
Cognition has been defined by Good as, "the faculty of knowing, especially as distinguished from feeling and willing." A.L. Glass and others define it in a broad spectrum as," all our mental abilities- perceiving, remembering, reasoning and many others - are organised into a complex system, the overall function of which is termed cognition." 6

Looking on the population of the children of grades I to IV, the present investigator accepted the simple definition of Good, for her study. Thus, “cognitive growth and development” is operationally defined as, “qualitative as well as quantitative changes taking place in the “knowing” realm (perceiving the environment) of GTC studying in grades I through IV.”

4.6 LIMITATION OF THE STUDY

The study has covered all the three different tribal zones in the state of Gujarat. However, the sample was drawn only from school-going tribal children. The children of grades I to IV were taken as subjects.

As the prime objective was to study the relationship of twelve independent variables with- two different measures of cognitive development - a development variable, different tools were newly developed. The cognitive ability tests - verbal as well as non-verbal - and achievement tests in three different subjects for grades I to IV were constructed anew using item-analysis. But they were not standardised in this study; only raw scores were utilised for statistical analysis.

4.7 SELECTION OF THE SAMPLE

Gujarat has concentration of scheduled tribes in three zones, that is, northern, central and southern zones. In the different zones, following districts have sizable tribal population.
ZONE
Northern
Central
Southern

DISTRICTS
Banaskantha, Sabarkantha
Panchmahals, Vadodara
Bharuch, Surat, Valsad and Dangs

From each zone, one district and two schools from that district were selected by randomization, using slips of a paper and drawing out necessary number from the same. After selecting a school, the pupils of whole division of a grade were taken up as subjects. At two places, it so happened that the required member of subjects were not available from one division. In such a case, pupils from the other division were included by a systematic random sample, that is, say, pupils having roll numbers 3, 6, 9, 12. ... and so on. At many places, there were not enough number of girls in one division. So all the girls from the other divisions were, then, included, as subjects. It was noted that such occasions arose especially in grade III. The number of girls in the grade IV was quite scanty. The last district where the administration was carried out was Bharuch. To have a moderate number of girls in the grade IV, girls from nearby tribal schools were included. It meant that the number of drop-outs in girls was more in upper grades.

Thus, it can be said that the present investigator adopted randomized stratified cluster sampling method for the selection of the subjects.

Figure 4.1 presents a picturesque sketch of selection of the subjects from different areas of Gujarat.
Fig. 4.1 TRIBAL REGIONS OF GUJARAT
(With The Selection of places for the study)
It was predecided that about 250 pupils should be selected from each grade, thus the total number of subjects would be about 1000. These pupils were to be administered all the four parts of cognitive ability tests, all the three achievement tests, visual recall test and intelligence (Draw-a-man) test. In this study, the objective was to construct item-validated tests of cognitive ability as well as achievement in three subjects. At the same time, it was also resolved to standardise all these cognitive ability tests as well as achievement tests as a post-doctoral study. It was decided that further analysis of the data collected on visual recall test and Draw-a-man test would also be carried out afterwards. It was why all these tests were also administered to 1000 pupils selected by stratified cluster sampling method.

Piagetian Conservation Tasks (PiCT) were to be individually administered by the present investigator. It was predetermined to have about twenty percent sample of the total sample selected. Thus the total sample would be about 200. The same subjects were to be taken for collecting data about independent variables for which two types of Information Data Sheets (IDs) were newly developed.

To collect all these data, the present investigator had to stay at one place for three days. Sometimes, she had to revisit a school for collecting incomplete information provided by the parents or the teachers.

After administering cognitive ability tests, she had to go through these tests before going to collect the data on PiCT. It was found that a large number of pupils did not respond fully to all the tests or responded half-heartedly, that is, making tickmarks only on one alternative, say, a, b, c or d upto some number of items. It was also observed that some pupils did not complete all the items though they were given liberal time-limit. Such cases were to be dropped. The number of such discarded cases was 36, 20, 18, and 9 for grades I to IV respectively.
4.7.1 Sample for administering Cognitive Ability Test (CogAT):

Tables 4.1 and 4.2 present the data on subjects whose responses on cognitive ability tests were analysed.

**TABLE 4.1**

**GRADEWISE DISTRIBUTION OF THE SAMPLE**

<table>
<thead>
<tr>
<th></th>
<th>Gr. I</th>
<th>Gr. II</th>
<th>Gr. III</th>
<th>Gr. IV</th>
<th>Total Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>119</td>
<td>121</td>
<td>123</td>
<td>156</td>
<td>519</td>
</tr>
<tr>
<td>G</td>
<td>80</td>
<td>90</td>
<td>89</td>
<td>51</td>
<td>310</td>
</tr>
<tr>
<td>TOTAL</td>
<td>199</td>
<td>211</td>
<td>212</td>
<td>207</td>
<td>829</td>
</tr>
</tbody>
</table>

**TABLE 4.2**

**SELECTION OF THE SAMPLE**
(Schoolwise, Gradewise and Sexwise)

<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>GRADE I</th>
<th>GRADE II</th>
<th>GRADE III</th>
<th>GRADE IV</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>G</td>
<td>B</td>
<td>G</td>
<td>B</td>
</tr>
<tr>
<td>Kuwarsi</td>
<td>12</td>
<td>08</td>
<td>19</td>
<td>03</td>
<td>19</td>
</tr>
<tr>
<td>(Banaskantha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanali</td>
<td>15</td>
<td>08</td>
<td>17</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>(Banaskantha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navagam</td>
<td>15</td>
<td>18</td>
<td>27</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td>(Panchmahals)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rupakheda</td>
<td>11</td>
<td>18</td>
<td>13</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>(Panchmahals)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kondh</td>
<td>29</td>
<td>18</td>
<td>21</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>(Bharuch)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navagam</td>
<td>37</td>
<td>10</td>
<td>24</td>
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<td>26</td>
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<tr>
<td>(Bharuch)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>B</td>
<td>119</td>
<td>121</td>
<td>123</td>
<td>156</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>80</td>
<td>90</td>
<td>89</td>
<td>51</td>
</tr>
</tbody>
</table>

The districts have been indicated within brackets.
The entire sample of 829 subjects was also administered Draw-a-Man Test, Visual Recall Test and all the three AATs to establish norms on tribal children, in future.

4.7.2 Selection of the Specific Sample for collecting data on remaining variables:

The main objective of this study was to bring out the relationship between the two measures of a dependent variable and twelve independent variables using stepwise regression analysis and canonical correlation analysis. For collecting data on the remaining variables, 200 pupils were to be selected. It was obvious that some pupils would not be present at the two sessions for administering PiCT. So it was decided to select twenty five percent of the sample from each school, after deleting the incomplete cases. The selection of subjects was done by proportionate random sampling. In each class, the list of boys and girls was separately made. From each grade, the total number for twenty five percent was computed and using slips of papers, proportionate sample was drawn from each sexwise group. Those who completed both the sessions for PiCT, where then, chosen for collecting data on independent variables. There also, some parents did not turn up or were reluctant to provide necessary data. Such cases were, then, to be discarded. It was also observed that many pupils from grade I did not follow the instructions fully though the tribal teachers' help was sought to translate instructions into their own dialect. Therefore, the maximum cases of drop-outs were from grade I. To have the number of cases almost equal from each grade, more than twenty five percentage of pupils were chosen from the grade I. The final selection consisted of 182 subjects, the respective gradewise number being 46, 44, 45 and 47. Thus, 182 subjects comprised the sample for canonical analysis.
4.8 TOOLS USED

Many tools were used in this study as the information for different thirteen variables was to be collected.

These tools could be divided into two categories:

(A) Totally Newly Developed Tools
(B) Modified /Readymade Tools

(A) Totally Newly Developed Tools:

1. CogAT for grades I and II (non-verbal) consisting of four subtests were newly developed. The subtests were: (a) classification (b) analogy (c) comprehension and (d) following instructions. In all, there were 60 items.

2. CogAT for grades III and IV (verbal): It had the following subtests; (a) classification (b) analogy (c) comprehension and (d) arithmetic ability - having two parts - series and equation building. This test also consisted of 60 items.

3. Achievement Tests in Gujarati, Mathematics and Environment for grades I to IV: In all, twelve different achievement tests were developed, each consisting of 15 items barring three mathematics tests for grades II, III, and IV (they had 20 items).

4. Information Data Sheet for parents (IDSp): It was developed with the help of three teacher-educators. Necessary data about pupils and parents were collected by this sheet. This sheet was filled in either by the present investigator or the teachers concerned. The parents were either called to the schools or the teachers visited their homes.

5. Information data sheet for teachers (IDSt): The information about teachers concerned (who taught the classes which were included in the sample) was gathered by this tool. Care was taken that all these sheets were distributed by the principals of respective schools.
(B) Modified/Readymade Tools

1. PiCT. Seven tasks were taken from the appendix part of the manual of British Ability Scales as well as a book on Jean Piaget. Taking into consideration the sample of tribal children, the mode of administration and instructions was modified a bit.

2. Visual Recall Test (Immediate and Delayed). The original test was modified by Sudha Patel while adapting “The British Ability Scales” for Gujarati subjects. There were twenty pictures in all. Some of them were remodified by the present investigator taking into consideration the tribal cultural environment.

3. Intelligence Test: To measure intelligence of the children of 6 to 11 age group, two types of “draw-a-man” test were utilised. For grades I and II, a picture (line-drawing) of incomplete man used in “Developmental Norms Project” which was financed by NCERT, New Delhi (J. H. Shah had worked as a research assistant in this project, during 1964-66) was made use of, after observing unsatisfactory responses on “Draw-a-man” test of Pramila Pathak. Of course, Pramila Pathak’s test with revised scoring keys was used for grades III and IV.

Thus, eight different tools were used in this study to collect data on thirteen different variables.

4.9 STATISTICAL TECHNIQUES USED FOR PROCESSING DATA

Statistical methods are simply tools and one cannot use a tool well with no clear purpose in mind. In all, fourteen different measures of variables were taken up in this study. In independent variables, some data were gathered in either a nominal or an ordinal scale. As such, parametric methods could not be applied to analyse all these data. In that case, arbitrary weighted scores were given to different categories and these scores were used in canonical analysis only. As Tabachnick and Fidell point out, “Discrete (nominal) variables may...
be used in multivariate analyses if there are several categories and the categories represent an attribute that changes in a quantitative way. Canonical analysis is but a part of multivariate analyses processes. Hence, this type of liberty was utilised while analysing data for canonical correlation.

The data available in an interval scale were analysed to have descriptive statistics namely, measures of central tendency (mean, median and mode), measures of variability (range, standard deviation), percentiles, skewness, etc. The ‘t-test’ was applied to see whether sex-wise as well as grade-wise differences between means were significant at .05 level. SPSS* MANOVA package was used for stepwise regression analysis as well as canonical analysis to test different hypotheses enumerated in this chapter.

4.10 AN OUTLINE OF THE WORK

Generally, educational development is divided into three important domains (a) Cognitive (b) Affective, and (c) Motor. Looking into priority and monetary resources available, the study touches upon only the first and foremost connected with the system. The cognitive domain is directly connected with the system of formal education and once, the stock of the present situation is taken, it becomes easy for policy makers to implement different programmes for the uplift of the scheduled tribes. It has been expected that this research would throw light on the actual cognitive growth and development of scheduled tribe-children - “what psycho-social factors are more effective and which are not”.

The study centered around the main objective of surveying selected factors (variables) in a tribal community of Gujarat State affecting the cognitive growth and development of its children. This was a survey type research. A correlation type of research was, then, undertaken on the basis of the result arrived at from this study.

As mentioned in earlier part of the chapter, the randomised stratified cluster sampling method was adopted to select the total sample of 829 subjects. For canonical correlational study, the total sample of 182 subjects was selected.
by a systematic random sampling method from the total sample of 829 subjects. The tribal children were selected from primary schools of different tribal areas scattered over the whole state of Gujarat. The selection was delimited to grades I to IV only.

4.10.1 Two measures of the dependent variable undertaken for this study:

a. Cognitive Ability Tests (CogAT) - $Y_1$

Four types of subtests were newly developed to measure cognitive ability of the children. For pupils of grades I and II, they were non-verbal (pictorial) type, more or less based upon the strategy of the Otis-Lennon Mental Ability Test. Four verbal subtests were also developed for pupils of grades III and IV. These were based on Lorge-Thorndike Cognitive Ability tests which consisted of 10 subtests out of which four types were selected which could be parallel to those, used for grades I and II. Non-verbal subtests for pupils of grades I and II were:

(i) Classification (ii) Analogy (iii) Comprehension, and (iv) Following Directions. Each subtest consisted of 15 items selected on the bases of facility value and discrimination index of each item. Four verbal cognitive subtests selected for pupils of grades III and IV were:

(i) Classification (ii) Analogy (iii) Comprehension and (iv) Arithmetic Ability: (a) Series and (b) Equation Building. Here also, the final version had 15 items in each subtest, the total number of items being sixty.

b. Piagetian Conservation Tasks (PiCT) - $Y_2$

The following Piagetian Conservation Tasks (PiCT) were included:

(i) Length (ii) Seriation (iii) Number (iv) Area (v) Mass (vi) Weight and (vii) Volume. These tasks were administered to the pupils individually, by the present investigator herself.
4.10.2 The independent variables included in the study:

1. Intelligence ($X_1$): Draw-a-man test ("Incomplete man") developed by NCERT, New Delhi, for its Development Norms Project was used for pupils of grades I and II while the latest revised Draw-a-man test of Pramila Pathak was used for pupils of grades III and IV.

2. Visual Recall Test (Immediate and Delayed) ($X_2$): While adapting British Ability Scales for Gujarati subjects for the doctoral degree under the supervision of J.H. Shah, Sudha Patel evolved this test in a modified form. This test was to be used for tribal children. Hence, it was necessary to remodify some of the pictures. In all, there were twenty pictures.

3. Academic Achievement of pupils of grades I to IV ($X_3$): To gather data about academic achievement of pupils in all the three subjects, namely, Mathematics, Gujarati and Environment, twelve achievement tests for grades I to IV were newly constructed by the present investigator. Tests of achievement for Gujarati and Environment consisted of 15 items in each, the selection of items being done on their facility value and discrimination index. An achievement test for mathematics for grade I also consisted of 15 items while those for grades II, III and IV consisted of 20 items. All the above tests were administered to the total sample of 829 subjects.

4. Birth-order of the pupil ($X_4$)

5. Number of siblings ($X_5$)

6. Pupil's inclination towards education ($X_6$)

7. Pupil's personality traits ($X_7$)

8. Socio-economic status (SES) of parents (education, occupation and income) ($X_8$)

9. Educational qualifications of teachers ($X_9$)
10 Educational experience of teachers \((X_{10})\)

11. Miscellaneous variables which may affect teaching of the teachers \((X_{11})\)

12. Effectiveness of teachers in creating interest towards learning in pupils \((X_{12})\)

Information data sheets for the parents and teachers were also developed to collect information for variables (iv) to (viii) and the remaining variables (ix) to (xii) respectively. These data were collected on 182 subjects only.

The data collected were analysed. The usual descriptive statistics - measures of central tendency (mean, median and mode), measures of variability (Range and Standard deviation), P25, P50 (median) and P75, measures of skewness and kurtosis were found out. Critical ratios (t-test) were computed, whenever needed, to find out significance of the differences between two different means - gradewise or sexwise. Before applying canonical analysis, stepwise regression analysis was also carried out. After interpreting the outcomes of the statistical analysis, the conclusions were drawn. Lastly, some topics of further researches were also enlisted.
REFERENCES


4. Ibid.: p.128.

5. Ibid.: p.82


