CHAPTER-6
6.1 Introduction

6.1.1 Variables
6.1.2 Research Design
6.1.3 Tools Used
6.1.4 Sample

6.2 Conclusion

6.2.1 Phase One : Mathematical Concept
6.2.2 Phase Two : Mathematical Concept
6.2.3 Phase Three : Mathematical achievement
6.2.4 Phase Four : Mathematical Achievement

6.3 Aggregate Message of the Research

6.4 Suggestions for further Research
CHAPTER VI
OBSERVATIONS, CONCLUSIONS AND SUGGESTIONS

6.1 Introduction

Mathematics demands conceptual understanding in the pupils. Without conceptual understanding, the pupils however good at intelligence, may be retarded pupils in mathematics. Moreover the conceptual understanding comes as a spontaneous growth or maturity in the pupils.

The intelligence of the pupils is the most prominent predictor of the mathematical concept and mathematical achievement high intelligence and low intelligence of pupils differ in mathematical concept and mathematical achievement.

Pupil's anxiety affects on mathematical concept and mathematical achievement. Pupil's anxiety plays the important role to produce the mathematical conceptual understanding and achievement in mathematics.

Need for achievement helps to pupils in mathematical conceptual understanding and to achieve mathematical achievement.

The cast of the pupils affects on mathematical conceptual understanding and achievement in mathematics. Non BC pupils achieve high scores than the BC pupils in mathematical conceptual understanding and achievement in mathematics.
Research studies on family reveal that it is the family size that positively or negatively influences the pupil's overall performance in their mathematical abilities. Children from large families are poorer in mathematics than children from small families.

The order of birth plays an important role in influencing the pupil's personality. Many studies on birth order reveal that the first born child of a parent is more likely to attain a position of intellectual eminence. The first born child shows more performance in mathematical concept and mathematical achievement than the second born child.

Generally the pupil's parent in education their boys more care than their girls. Boys and girls differ in mathematical conceptual understanding and mathematical achievement.

In order to have some idea of predictors of mathematical concept and mathematical achievement, the present researcher has selected the problem for research.

6.1.1 Variables

As has been described earlier, the present research problem was multi-dimensional. There were seven independent variables operating at two levels. They were:

1. Caste (BC and non BC)
2. Intelligence (High and low)
3. Anxiety (High and low)
4. Need for achievement (High and low)
5. Family size (Large and small)
6. Birth order (First and second)
7. Sex (Boys and girls)

There were two main dependent variables.
1. Mathematical concept
2. Mathematical achievement

Thus there were two dependent variables in this study which was divided into four phases.

6.1.2 Research Design

There were seven independent variables operating at two levels. The 2 x 2 x 2 x 2 factorial design was invoked to study the main and interactive effects of following four independent variables for first and third phase.

1. Caste
2. Intelligence
3. Anxiety
4. Sex

The 2 x 2 x 2 x 2 factorial designs was invoked to study the main and interactive effects of following four independent variables for second and fourth phase.

1. Need for achievement
2. Family size
3. Birth order
4. Sex

There were four 2 x 2 x 2 x 2 factorial designs invoked in this study.
6.1.3 Tools Used

The following tools were used:


3. The adopted Smith’s n-Ach measure standardised by D.N. Patel and J.C. Parikh, S.P. University, Vallabhidyanagar.

4. The pupil’s Demographic Bio-data proforma prepared by the investigator.

Mathematical Concept

The Test for mathematical concept was prepared by the investigator.

Mathematical Achievement

The marks obtained in the annual examination in mathematics have been considered as the mathematical achievement of the pupils.

6.1.4 Sample

The investigator administered Intelligence Ability Test to the initial sample of 1980 of grade VIII of 42 schools of Mehsana District. Initially 1035 boys and 945 girls were selected as a sample. He got 643 pupils having high intelligence and 623 pupils having low intelligence. Middle 714 pupils were ignored.

Anxiety test was administered to 1980 pupils. He got 474 pupils having high anxiety and 491 pupils having low anxiety. Middle 1015 pupils were ignored.
Need for achievement test was administered to 1980 pupils. He got 770 pupils having high n-Ach and 758 pupils having low n-Ach. Middle 452 pupils were ignored.

The pupils Demographic Bio-data proforma was administered to 1980 pupils. He got 1694 from large family and 286 from small family, 360 pupils having 1st birth order and 298 pupils having 2nd birth order and 592 pupils having BC and 1388 pupils having non BC.

The experimental design had 16 cells of groups (2x2x2x2). In each of the sixteen cells, the number of pupils were kept uniform. To maintain uniformity of the number of pupils in each cell, the investigator decided to take 10(Ten) students as the total population in each cell. So the final sample further shrunk to 160 (10x16).

The data were collected. Four way analysis of variance (ANOVA) was employed to study the various effects of independent variables.

For locating significance in interactive effects, Newmankeul's test was employed as it is considered to be a conservative test, components of variance were calculated for each phase.

The interpretations and conclusions were made from the analysis.
6.2 Conclusions

Table 6.1 depicts the F-ratio of all the phases for all the major variables. This table would act as ready reckoner to the conclusions listed in the following pages.
### Table 6.1 F-ratio of Main and Interactive Effect of All Phases (Ready Reckoner)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variables</th>
<th>Phase One Mathematical Concept</th>
<th>Phase Three Mathematical Achievement</th>
<th>Variables</th>
<th>Phase Two Mathematical Concept</th>
<th>Phase Four Mathematical Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Caste (A)</td>
<td>17.22 **</td>
<td>0.99</td>
<td>N-Ach (A)</td>
<td>2.46</td>
<td>3.13</td>
</tr>
<tr>
<td>2.</td>
<td>Intelligence(B)</td>
<td>810.43 **</td>
<td>462.91 **</td>
<td>Family Size(B)</td>
<td>1.56</td>
<td>0.27</td>
</tr>
<tr>
<td>3.</td>
<td>Anxiety (C)</td>
<td>8.54 **</td>
<td>3.76</td>
<td>Birth Order(C)</td>
<td>5.04 *</td>
<td>1.46</td>
</tr>
<tr>
<td>4.</td>
<td>Sex (D)</td>
<td>0.25</td>
<td>1.12</td>
<td>Sex (D)</td>
<td>0.55</td>
<td>0.79</td>
</tr>
<tr>
<td>5.</td>
<td>A X B</td>
<td>9.31 **</td>
<td>7.26 **</td>
<td>A X B</td>
<td>8.43 **</td>
<td>4.09 *</td>
</tr>
<tr>
<td>6.</td>
<td>A X C</td>
<td>1.71</td>
<td>0.99</td>
<td>A X C</td>
<td>0.18</td>
<td>1.18</td>
</tr>
<tr>
<td>7.</td>
<td>A X D</td>
<td>0.00</td>
<td>5.31 *</td>
<td>A X D</td>
<td>5.30 *</td>
<td>0.13</td>
</tr>
<tr>
<td>8.</td>
<td>B X C</td>
<td>5.79 *</td>
<td>0.69</td>
<td>B X C</td>
<td>2.58</td>
<td>3.13</td>
</tr>
<tr>
<td>9.</td>
<td>B X D</td>
<td>3.10</td>
<td>0.09</td>
<td>B X D</td>
<td>0.97</td>
<td>0.74</td>
</tr>
<tr>
<td>10.</td>
<td>C X D</td>
<td>0.19</td>
<td>3.01</td>
<td>C X D</td>
<td>0.47</td>
<td>1.52</td>
</tr>
<tr>
<td>11.</td>
<td>A X B X C</td>
<td>5.18 *</td>
<td>0.65</td>
<td>A X B X C</td>
<td>3.22</td>
<td>0.00</td>
</tr>
<tr>
<td>12.</td>
<td>A X B X D</td>
<td>1.63</td>
<td>5.06 *</td>
<td>A X B X D</td>
<td>0.04</td>
<td>0.96</td>
</tr>
<tr>
<td>13.</td>
<td>A X C X D</td>
<td>4.47 *</td>
<td>0.13</td>
<td>A X C X D</td>
<td>0.44</td>
<td>0.24</td>
</tr>
<tr>
<td>14.</td>
<td>B X C X D</td>
<td>5.96 *</td>
<td>5.69 *</td>
<td>B X C X D</td>
<td>0.025</td>
<td>0.00</td>
</tr>
<tr>
<td>15.</td>
<td>A X B X C X D</td>
<td>0.91</td>
<td>1.12</td>
<td>A X B X C X D</td>
<td>0.27</td>
<td>0.82</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

** Significant at 0.01 level
There were four phases, hence the conclusions of each phase have been given separately phase-wise.

Phase one and two dealt with the mathematical concept scores while that of phase three and four dealt with the mathematical achievement scores.

6.2.1 Phase One: Mathematical Concept scores

1. Intelligence ability was a dominant predictor of mathematical concept scores. High intelligence pupils scored significantly better than low intelligence pupils. The contribution of intelligence ability was 26.71 percent to the mathematical concept scores.

2. Caste was the second predictor of mathematical concept. Non BC pupils achieved more marks than BC pupils. It had contributed 16.73 percent to the mathematical concept scores.

3. Caste and intelligence (AxB) interaction was third predictor of mathematical concept. It had contributed 12.28 percent to mathematical concept scores.

4. Anxiety was the fourth predictor of mathematical concept. Pupils having low anxiety achieved high scores on mathematical concept than a pupil having high anxiety. It had contributed 11.63 percent to the mathematical concept scores.

5. Intelligence, anxiety and sex (B x C x D) interaction was fifth predictor of mathematical concept. It had contributed 8.94 percent to the mathematical concept scores.
6. Intelligence and anxiety (B x C) interaction was the sixth predictor of mathematical concept. Intelligence and anxiety interacted with each other in producing mathematical concept scores. It had contributed 8.76 percent.

7. Caste, intelligence and anxiety (A x B x C) interaction was the seventh predictor of mathematical concept. It had contributed 7.98 percent.

8. Caste, Anxiety and Sex (A x C x D) interaction was the eighth predictor of mathematical concept. It had contributed 6.97 percent.

9. Sex of the pupils had not contributed to mathematical concept.

6.2.2 Phase Two: Mathematical Concept Scores

10. Need for achievement and family size (A x B) interaction was the first predictor of mathematical concept. Need for achievement and family size interacted with each other in producing mathematical concept scores. It had contributed 42 percent.

11. Need for achievement and sex (A x D) interaction was the second predictor of mathematical concept scores. Need for achievement and sex interacted with each other in producing mathematical concept scores. It had contributed 29.63 percent.
12. Birth order of the pupils was the third predictor of mathematical concept scores. Pupil having 1st birth order scored significantly better than pupil having 2nd birth order. The contribution of birth order was 28.37 percent to the mathematical concept scores.

13. Need for achievement, family size and sex had not contributed to mathematical concept.

6.2.3 Phase Three: Mathematical Achievement

14. Intelligence was a prominent predictor of mathematical achievement. Pupil having high intelligence achieved significantly more marks than pupil having low intelligence on mathematical achievement scores. It had contributed 43.06 percent to mathematical achievement scores.

15. Caste and intelligence (A x D) interaction was the second predictor of mathematical achievement. It had contributed 16.95 percent to mathematical achievement. Caste and intelligence interacted with each other in producing mathematical achievement scores.

16. Intelligence, anxiety and sex (B x C x D) interaction was the third predictor of mathematical achievement. It had contributed 14.04 percent.
17. Caste and Sex (A x D) interaction was the fourth predictor of mathematical achievement. It had contributed 13.24 percent.

18. Caste, intelligence and sex (A x B x D) interaction was the fifth predictor of mathematical achievement. It had contributed 12.71 percent.

19. Caste, anxiety and sex had not contributed to mathematical achievement.

6.2.4 Phase Four: Mathematical Achievement

20. Need for achievement and family size (A x B) interaction was a predictor of mathematical achievement. It had contributed 100 percent to Mathematical achievement scores. The main effects of n-Ach and family size were not significant but n-Ach and family size interacted with each other on producing mathematical achievement.

21. The main effect of birth order was not significant. So birth order had not contributed to mathematical achievement.

22. The main effect of sex was not significant. So sex had not contributed to mathematical achievement.

23. The pupils having high n-Ach and small family achieved the highest scores on mathematical achievement while pupils having low n-Ach and small family get lowest scores.
6.3 Aggregate Message of Research

After describing at length the procedure, the analysis and the interpretations, the question arises, 'What is the aggregate message of this study?'

The aggregate message is directed towards the principals, educationalists, teachers and the guardians of the pupils.

The implications of the study are self-evident and self-explanatory too. However, the following implications should be noted earnestly.

1) The caste of the pupils should be taken into account while dealing with the pupils attacking with their problems in mathematics and its ability.

2) Though intelligence is viewed as a biological or genetic property of the pupil; it is positively influenced by educative experiences in special and favourable environment in general. Intelligence is the main predictor of mathematical concept and mathematical achievement. The intelligence of the pupils should be known before starting teaching. Pupils intelligence accordingly should be given teaching of mathematics. So, every school know for intelligence of the pupils should be purchased intelligence ability test.
3) Teachers should create such a tension-free environment in schools so that pupils' growth and progress in mathematical concept is not endangered by the negative influence of school anxiety.

4) As high n-Ach positively affects the pupils mathematical concept and mathematical achievement, the school authorities should teach and train their pupils to be able enough to meet with tough situation and challenges.

5) As the small family provides better educational facilities and opportunities to children, parents or guardians should enhance their children's or wards' progress and competence in mathematical ability. They should delimit their families as per the national government's policy for family planning so that they can adequately take care of their children and give sufficient time for their learning.

6) As children having other than first birth orders are found comparatively under achievers or less achieving in mathematical concept, parents should structure their families so that first born or second born children are available in the form of good learners or better learners in mathematics respectively. The parents should, therefore, aim and plan for having first rank children as first rank learners.

6.4 Suggestions for further Research

The present research was merely an exploratory effort based on the ANOVA model of a fixed type. Hence the recommendations cannot be generalised beyond the sample. A number of research
14. studies would be required to be carried out in this direction with multiple variables. The following is tentative list of some further research problems though it is by no means an exhaustive list.

1. A study of the mathematical conceptual understanding difficulties among secondary school pupils: Their diagnosis and correction.

2. A comparative study of the mathematical achievement of the S.C/S.T. and the baxi commission caste pupils in relation to their academic achievement, personality, parental education and birth order.

3. An investigation into intelligence, anxiety and n-Ach of the pupils as predictors of scientific concept and achievement in science.

4. An investigation into the conservation ability and intelligence of the pupils as predictors of mathematical achievement.

5. An investigation into the mathematical ability of the secondary school pupils linked with intelligence.

6. An investigation into the relationship between mathematical ability and reading ability of pupils studying in pre-primary and primary schools.
7. An investigation into intelligence, personality and anxiety of the pupils as predictors of mathematical concept and mathematical achievement.

8. An investigation into the mathematical ability of the pupils in the context of certain personality traits.


10. A study of mathematical conceptual understanding and scholastic attainment of the secondary school pupils.