CHAPTER VI

DISCUSSION AND FINDINGS

6.1. A. PERFORMANCE OF PUPILS UNDER NEW METHODS OF TEACHING MATHEMATICS:

According to the sample design, pupils of the experimental groups of class IX and X of both urban and rural areas were taught by three new methods: (1) Programmed Instruction methods (2) Integrated Programmed Instruction method and (3) Objective Based Teaching method at equal interval of time. Similarly, the control groups of class IX and X were taught by the traditional method. Both the groups had been administered the Pretest and the post test. The half yearly examination's record of mathematics of the respective pupils had been collected from the concerned schools. All the marks of those three tests were separately grouped under frequency distribution tables. The corresponding frequency curves were drawn as shown in Fig. 5.1 to 5.3.

(a) Results of class IX:

The frequency distribution curves of half yearly test, pretest and post test obtained from the frequency distribution tables, were shown in Fig 5.1. The methodwise post test data were collected. So in the fig. under each of the four methods of teaching, the frequency distribution tables and corresponding curves were shown. The calculation showed that the scoring range of the pupils of the urban and rural areas was higher i.e. the spreadness of scores was higher in case of experimental group. This was true almost in each case of all new teaching methods used.

While comparing this result with that of the control group of the urban and rural area it was found that the spreadness of
variability or deviation of scores was not higher. The scores were clustered in small range with lower mean value which is evident from the fig. 5.1

The calculation of the data of the experimental group of urban area showed that the difference of means was significant at 5% in respect of each of the new methods of teaching and the coefficient of correlation between the scores obtained in the pretest and the post test of the same group was high. But the data obtained from the control group showed that the difference of means of the pretest and the post test was not significant at 5% level but on the other hand, the coefficient of correlation was significant at 5% level.

(b) Result of class-X:

Similarly for the pupils of class X, data of 30 regular pupils from the experimental group and 30 regular pupils from the control group were taken into consideration. The half yearly record (from school), pretest and post test data for three different new methods used in the experimental group and the traditional method for the control group, had been considered.

The frequency distribution tables for three tests using different new methods of teaching, each had been shown in table No. 5.9 to 5.16. The frequency polygon curves were shown in fig. 5.3. It was evident from the graphs that the range of scores was higher of the experimental group in each of new methods used but the range of scores in case of control group is lower with low mean value.
The calculation showed that the significance of the difference of means between the pretest and the post test was significant at 5% level with low correlation between the scores of the pretest and the post test in three different methods in the experimental group but in the case of control group, the difference of means is significant at 5% level with high correlation coefficient.

2. AREAWISE PERFORMANCE -(1) Class-X. :

(a) Rural area :

In the experimental and control groups of the rural area, the calculation showed that the difference of means of the pretest and the post test scores of each of the new methods of teaching under study was found to be significant at 5% level with low correlation coefficient in case of the experimental group. But in the control group, the difference of means was not significant as well as the negligible correlation.

(b) Urban area :

The results indicated by tables 5.17 to 5.22 showed that there was significant difference of means between the scores obtained by pupils of the experimental group and that of the control group of Class X of Urban area. The mean and the S.D. under P.I. method were 16.5 and 3.82 of the experimental group and those of the control group were 9.5 and 3.567. This shows that the performance of the experimental group was better than the of the control group. Similarly, when comparing the performance in other two new teaching methods, with the traditional method, it was seen that the effect of new methods was better than the traditional method. The result of the pupils of class-X and class XII in the C.B.S.E. examination was very poor and that too, the failure in mathematics was high in every year.
particularly in the State of Arunachal. This gives an indication that the traditional method or teacher's method would not helpful in teaching mathematics in the high schools and the higher secondary schools of this North Eastern hilly state. The new instructional technique will be of great help for better performance in mathematics. In the Rural Area the self learning attitude is not significant as indicated by low performance in P.I. and I.P.I. method than in the O.B.T. method. But the performance of the control group is lower than that of the experimental group, which shows that the pupils of the experimental group with new teaching methods have better performance than the pupils of the Control Group.

(2) Class IX:

In Class IX, both in urban and rural area when the data of the pretest and the post test were analysed, it is seen that there was significant difference of means at 5% level. Only in the rural area, the experimental group could not show better result which was in exception and might be due to chance factor or fluctuation of sample design. The above result conforms with the result by Kenneth, E.Brown and Theodors, L. Abell (1966). In another better students made more use of the programmed materials, the more able students made greater achievement again.

So the hypothesis 1 fails. The performance of the experimental group is better than that of the control group.

5.3. C. TESTING OF EFFICIENCY OF NEW METHODS:

The analysis was carried out to forecast the efficiency of new methods of teaching mathematics at the secondary level of Arunachal Pradesh in particular.
The results of the tables 5.25 to 5.28 indicate the efficiency of new teaching methods of mathematics. In Class X it is found that the programmed instruction and the integrated programmed instruction were preferable to the objective based teaching method both in urban and rural areas. In Class IX mainly in Urban area, P.I. and I.P.I. were found more efficient than O.B.T. but in the rural area, O.B.T. was shown better and it supports the previous results of the experiments. The self learning process or the step by step method of teaching mathematics is favourable to the urban pupils. This result was supported by another test "Analysis of Covariance" between samples means. The result of this test analysis indicated in table No. 5.30 to 5.53, showed that the hypothesis 3 fails as there is significant difference of means of the simples obtained by using variety of teaching methods, both in Class IX and Class X.

This result is in conformity with the finding regarding the efficiency of teaching methods by "Mouroe and Marks" in the book "Educational Psychology". He observed that due to the complexity of the conditions involved, it was usually not been possible to control all the important variables. The same difficulty was also faced by this researcher also. He observed that the enthusiasm of mathematics teachers was one of the causes for arriving at an uniform conclusion. Besides, the result of the efficiency of the pupils in this study showed that students' initiative and responsibility of urban area was better than that of rural area.

\[ D. \text{ TESTING OF EFFECTIVENESS OF METHODS BY 'PAIRED TEST' :} \]

The result indicated in table 5.34 to 5.50 showed that the teaching by new methods was found more effective as indicated by the result of the paired test before and after teaching. This
result is in conformity with the finding of the study, by Rao, T.G. (1985). According to him, the performance of the experimental group by the programmed instruction method was better than that of the conventional group. He also observed that there was no sex difference. In the learning gain of the programmed learning method of urban area was higher than that of rural area. Rastogi, S (1983) in his research findings stated the effectiveness of the programmed materials amongst the students. He was of the opinion that the programmed materials were effectively used in higher classes in teaching mathematics.

The main purpose of this study was to test the effectiveness of new instructional methods of teaching mathematics at the secondary schools, particularly in the hilly state "Arunachal Pradesh" under the New Education policy (1986). It has been clear in this study that the development and use of better and appropriate methods of teaching mathematics at the secondary school, become necessary for the pupils of secondary schools of Arunachal Pradesh for their low performance in Mathematics in the class room examination as well as in the public examination like C.B.S.E.

5. SUMMARY:

The sample of this study consisted of 480 (240 urban and 240 rural) male and female pupils of class IX and class X, purposely selected from four secondary/higher secondary school (2 urban and 2 rural) of two hilly districts of Arunachal Pradesh. Experienced teachers of Mathematics of those schools were engaged to teach the control group by traditional method and the research scholar himself taught the experimental group using new methods selected for the purpose. It is worth noting that the selection of appropriate teaching methods depends upon a number of factors—the most important of which, concerns with the objectives which have to
be achieved by the pupils. The objectives that a pupils has to develop, are knowledge understanding, application and skill. All these objectives are included in the new teaching methodologies- like (1) Programmed Instruction, (2) Integrated Programmed instruction and (3) objective Based teaching. The pre-post test design was used to determine the effect of teaching through new methods. The 't' test 'F' test, analysis of convanience and other statistics were used in the analysis of data.

6 FINDINGS OF THE STUDY AND CONCLUSION :-

The findings of the study were as follows :-

(a) Effect of new instructional methods in teaching mathematics :-

(1) The performance of pupils in mathematics is effected by the new instructional methods over the traditional method. The urban and rural pupils of Arunachal Pradesh in the secondary school were benefited by new methods of teaching of mathematics as it is evident that there was significant difference of means in the performance of pupils in the new instructional methods. Hence the hypothesis 1 failed.

(2) The effect of new instructional methods in teaching mathematics of the experimental group was more significant than that of the control group. Hence the hypothesis 2 failed.

(3) The effect of traditional method in teaching mathematics either in urban or in rural area for better performance is not significant.

(4) The efficiency of new methods was found to be more than that of the traditional method both in urban and in rural areas. Hence the hypothesis 3 failed.
(5) The programmed instruction method was found to be more efficient than the other new methods in teaching mathematics in the higher classes.

(6) In particular, there is significant difference of means of the performance of pupils of urban areas by the P.I. method than that of other new methods.

(7) In rural area, pupils had shown better performance in mathematics when taught by the O.B.T.

(8) The efficiency of P.I. method is found to be better than that of other new methods.

(9) While comparing the effectiveness between two new methods, it is found that the difference of means is significant at 5% level in each case.

(b) Area wise effect of new instructional methods :-

(10) The effect of new instructional methods in teaching mathematics in urban area was better than that in rural area. The experimental group of urban area had shown better performance in pre-test and post test and had good correlation.

(11) The achievement of the experimental group of urban area in the post test is better than that of the control group of the same area both Class X and Class IX. This shows that the hypothesis 3 fails.

(c) Effect of Sex difference :-

(12) The performance of boys and girls of urban area was not significantly different in the performance when different new instructional methods used in the experimental group. Hence the hypothesis 4 was accepted i.e. boys and girls were good but in the rural area, the hypothesis 6 failed. Girls were lagging behind in learning mathematics than boys. It was due to the geographical factor and home environment.
6.7. MAIN FOCUS ABOUT FINDING :-

1. From the above stated findings, it is crystal clear that the step by step sequential approach of teaching mathematics in the classroom teaching is needed.

2. It is very clear that the mathematics teachers of secondary schools of Arunachal Pradesh have to labour hard to teach mathematics in class with proper methods of teaching.

3. The teacher's training in mathematics in the new methods of teaching is urgently necessary for better teaching in mathematics.

8. SUGGESTION FOR FUTURE STUDY :-

Keeping in view, the findings of the present study, the following suggestions are made for further research work in this field.

1. In view of the encouraging results obtained from this study, it will be worthwhile to replicate the study at other grade levels and with other subject matter fields like science, social studies and languages. The work on mathematics at the elementary level will be more useful.

2. It will be worthwhile to study the diagnostic and remedial teaching of mathematics in the classroom teaching.