CHAPTER IV

ANALYSIS AND INTERPRETATION

4.0. INTRODUCTION

The data pertaining to various objectives and corresponding hypotheses of the study were obtained in accordance with the procedure described in Chapter III. These data would have remained merely a meaningless heap of facts unless this had not been statistically processed and analyzed. So, in order to give the present study a meaning and scientific hue - a desired shape and direction, the data were subjected to appropriate statistical procedures. An attempt has been made in this chapter to results emerging from the analysis of data. The interrelation of the results related to different variables of the study and their discussion have also been included in this chapter.

The variable studied in the present study is achievement in Biology. The study was conducted with the help of three groups, in which two groups were assigned as Experimental group I and Experimental group II and one group was assigned as control group. The pupils of the Experimental group I, Experimental group II and Control group were taught certain lessons of Biology through Concept Mapping Model, Concept Attainment Model and
Traditional Method, respectively. To eliminate the variability the groups were equated on the criteria of Mental Ability, Socio-Economic Status.

For this study, Null hypotheses were formulated which assert that there were no true difference between two population means. Significance of difference was to be found to determine relative effectiveness of Concept Attainment Model and Concept Mapping Model. Under these conditions, the t-test is considered a suitable technique for statistical analysis Walker and Lev (1953), Edwards (1960), Garret (1966). It is a reliable technique to determine whether difference between means of two groups is significant or not. Usually a difference is marked significant when the gap between two sample means signifies a real difference between the parameters of the populations from which samples were drawn. In order to reject or retain the null hypotheses .05 and .01 levels of significance are generally used.

4.1 ANALYSIS AND INTERPRETATION

In the scheme of this study, pupils' achievement in Biology is the first outcome variable. This has been studied here focusing on the following objectives:

1. To compare the mean scores, on criterion achievement test in Biology, of the two groups of pupils - Experimental group I and control group

2. To compare the mean scores, on criterion achievement test in Biology, of the two groups of pupils - Experimental group II and control group
3. To compare the mean scores, on criterion achievement test in Biology, of the two groups of pupils - Experimental group I and Experimental group II

The three groups have been compared using 't' test. For this purpose, the Table 4.1 to 4.3 provide the mean, standard deviation and 't' values in respect of scores on criterion achievement test of experimental and control groups of pupils. 't' test has been applied to test the significance of difference between the means of (i) Experimental group I and Control group (ii) Experimental group II and Control group (iii) Experimental group I and Experimental group II. These have been discussed below:

**Table 4.1**

**CONCEPT MAPPING MODEL AND TRADITIONAL METHOD**

From Table 4.1 it may be observed that the 't' value of 23.36 for the difference in mean achievement scores, of the pupils of Experimental group I and Control group, is significant at 0.01 level. The table also reveals that the mean score of 66 of the pupils of Experimental group I is higher than the mean score of the control group which is 24.645. This indicates that achievement in biology of the pupils of Experimental group I is higher than that of the Control group after the treatment.
Experimental group I and Experimental group II is significant at 0.01 level. It may also be observed from the table that the mean score of 66 of the pupils of Experimental group I is higher than the mean score of the Experimental group II which is 52.0178. This indicates that achievement in biology of the pupils of Experimental group I is higher than that of the Experimental group II after the treatment.

4.2 CONCLUSION

The results obtained from tables 4.1 to 4.3 indicate that the mean score on achievement in Biology of the pupils of:

i) Experimental group I is significantly higher than that of Control group

ii) Experimental group II is significantly higher than that of Control group

iii) Experimental group I is significantly higher than that of Experimental group II

On the basis of the results obtained from the analysis of the data and the interpretation of the results done numerically, related to pupils’ achievement in Biology, the following hypotheses of the present study were rejected:

H01 There will be no significant difference between achievement scores of pupils' taught through Concept Mapping Model and Traditional Method.
H02 There will be no significant difference between achievement scores of pupils' taught through Concept Attainment Model and Traditional Method.

H03 There will be no significant difference between achievement scores of pupils' taught through Concept Mapping Model and Concept Attainment Model.

Thus it may be concluded on the basis of this study and studies conducted by other researchers, both in India and abroad, that Concept Mapping Model and Concept Attainment Model are effective in raising pupils' achievement. It shows that pupils who learn through Concept Mapping Model and Concept Attainment Model learn better than those who learn through traditional method.

4.3 EDUCATIONAL IMPLICATIONS

The results and conclusions arrived at during the course of this study clearly underline the effectiveness of Concept Mapping Model and Concept Attainment model in raising the students cognitive achievements. These findings have a number of important implications for teachers, teacher educators, curriculum makers and planners and for the society by and large.

1. The first finding of the present study implies that the students taught through Concept Mapping Model and Concept Attainment Model achieve significantly higher than the student taught through Traditional method. One of the major implications of the finding that equality of learning outcome can be a goal of education rather than equality of opportunity. In order to achieve this goal of education, it becomes imperative for the
teacher to address himself to the requirement of each student and help him when he needs it.

2. Concept Mapping Model involves certain steps which have to be followed for obtaining the optimum results. This suggests that teachers need to be trained in Concept Mapping procedures so that they may employ the model efficiently to achieve the goal of maximizing student's cognitive outcome. Since Concept Mapping Model is geared to tackle sensitively and systematically the needs of the students, it necessitates the use of resources and time in accordance with the student's requirements. This in turn underlines the significance of the role of teacher in organizing the classes. An efficient organization of classes can not be possible unless a teacher is allowed some degree of freedom.

3. Since Concept Mapping is significant, the role of the teacher can not be underestimated if it is to be used effectively in actual classroom conditions. It, therefore, becomes essential that the teacher educators should incorporate the theoretical and practical aspects of this model in teacher training courses at all levels. This will impart the skills, abilities and knowledge related to Concept Mapping Model to the prospective teachers. But in order to make it an integral part of teaching methods widely used in our schools, it is necessary that it would also be incorporated in in-service training programmes for teachers.

4. Even after providing necessary training to teachers in the use of Concept Mapping Model and allowing them some freedom in organizing their classes and resources, it is near impracticable ideal to expect
teachers to prepare and provide all the necessary material to the students. It is, therefore, necessary that curriculum developers should prepare packages of instructional material, which may be used by teachers in their actual working conditions with minor adaptations if necessary.

5. To enhance the effectiveness of teaching, planners and makers of curriculum should provide details and practicable guidelines to the teachers regarding the selection and use of material to suit the requirements of their students. Concept Mapping Model envisages teaching of learning units in hierarchical order. A student equipped with the pre requisites learns the learning unit more efficiently and in a shorter period. This implies that courses should be constructed keeping in view hierarchical relationships in the units to be taught.

6. The results of this study, in conjunction with those of other researches conducted in India, indicate that Concept Mapping Model if adapted suitably to Indian conditions can offer answers to many of the problems and challenges besetting our educational scene. Concept Mapping Model emphasizes raising the achievements of students by a sensitive and systematic response to the needs and difficulties of each student. This introduces the element of personal fear and instruction in this method of teaching. The increase in student achievement cultivates in him a sense of confidence and of desire to learn more. This can prove very effective in controlling and even reducing the rate of drop outs in our schools.
7. The findings of this study suggest that a sizeable number of learners can be brought to the high level of achievement in any area of learning if suitable conditions are provided to the learner. It implies that to meet the requirements of our society in modern times of rapid development in Science and people with special talents, abilities and skills can be provided by our educational institutions if Concept Mapping Model is used extensively and efficiently at different levels on instructions. It must be geared to develop the education system relatively early and to educate such talents in a systematic way over relatively long periods of time.

8. Concept Mapping Model can prove relevant and effective in tackling some of the other socio-economic problems affecting our society. Any observer of Indian educational system and society can easily notice the gaps which exist in the quality of education being imparted to the pupils of the upper class and to those coming from the lower strata of our society. Students coming from the educated and well off families get intensive and efficient coaching even outside the class. But those students whose parents can not afford expensive schools for extra private coaching for their children find themselves at a disadvantageous position. These gaps in the quality of education tend to perpetuate the social and economic disparities. Since Concept Mapping Model holds out the promise of developing the cognitive outcomes of our vast majority of students within the class room facilities, it can bring the students of socially and economically backward section to the level of achievement
where they can compete with the boys and girls of the more fortune sections of our society.

9. Concept Attainment Model has an important role in bringing about enrichment in teaching process; it could serve as instructional approach to manage the class room activities according to the pre disposition of the learners in order to achieve a variety of educational objectives.

10. Concept Attainment Model is aimed at teaching skills of arriving at generalizations through meaningful processing of large and fragmentary data. During the course of using this model, the learner develops inferential hypothesizing skills also. Concept Attainment Model has a varying degree of structure depending upon the initiative and control of the teacher during various phases of the model. Every phase of the model is initiated with questions posed by the teacher to direct the student's attention to certain specific aspects of the data and undertake various mental activities. The class room environment becomes more cooperative. The students are encouraged by the teacher in active responsiveness.

4.4 SUGGESTIONS FOR FURTHER RESEARCH

In this age of unprecedented development complexity and competition, the role of education has assumed a central crucial significance all over the world. It is, therefore, not only desirable but absolutely necessary to find and develop ways and means to make our educational system fully responsive to the emerging needs of today. The present study has been a modest attempt at testing the effectiveness of Concept Mapping
Model and Concept Attainment Model in coping with pressures and challenges being confronted in our country. This study, however, does not pretend to offer the final word on the effectiveness of Concept Mapping Model and Concept Attainment Model. In order to supplement the outcomes of the present endeavor, more research related to Concept Mapping model and Concept Attainment model are warranted so as to develop a body of vital knowledge of how to optimize students learning.

1. The present study was confined to an experiment treatment of twenty days only. It is therefore reasonable to avoid wide and sweeping generalizations about its outcomes particularly the long term consequences of Concept Mapping Model and Concept Attainment Model. Hence, detailed longitudinal studies that follow students and teachers over a period of several years, particularly through continued applications of Concept Mapping procedures are required in order to arrive at still more reliable and precise results of this model.

2. Another area for potential research is provided by the effect of using Concept Mapping Model on the teacher and his role in the class. Since Concept Mapping Model involves a measure or a personal interaction between the teacher and the taught, it makes the teacher more observant, innovative and responsive to the needs of each student. The results obtained also affect the attitude towards the commitment to the profession. An examination of the various effects of Concept Mapping Model on teacher role and on inter personal relations of students can thus provide new insights into the outcomes of Concept Mapping Model.
3. The present endeavor has remained confined only to ninth grade students. It may be rewarding to examine the effects of Concept Mapping Model on students of other grade also. It can provide useful information above the level of effectiveness of Concept Learning with students of different grades and age groups.

4. Different socio-economic and cultural backgrounds have a casual relationship with student's achievements. Since the present study was conducted on sample taken from schools of NOIDA, studies are warranted in rural areas, urban slums and of students of schedule caste and schedule tribes. Such studies can provide useful information about how to make Concept mapping model more efficient in the conditions under which students of socially, economically and culturally backward sections of our society have to work.

5. Concept learning can offer an effective instructional procedure to head students needing special care and attention. In this context, emotionally disturbed habitual trend mentally retarded and physically and visually handicapped students and their problems offering challenging and fruitful area of research to investigate.

6. Effectiveness of Concept Mapping Model and Concept Attainment Model may be researched at large scale for learners of different age groups, subject area, self esteem, sex etc.

7. The teacher behavior under the two models of teaching here also needs to be analyzed from the transcripts of the lesson transacted using these two models.
8. School curriculum consists of number of subjects mainly Social Science, Physics, Chemistry and languages. Since the present study has focused on the effects of Concept Mapping Model and Concept Attainment Model on student's achievements and their creative abilities in Biology, research in our country is needed to assess the effects of these models in teaching other subjects also.

9. An investigation into less time and learning tasks can be best managed to achieve the optimum results and how initial abilities of students affect their achievements can prove to be a rewarding area for research. Some of the students in Concept Mapping classes learnt faster than their peers. A research aimed at finding out how their extra time in the class can be best utilized can offer suggestions to make Concept Mapping Model more effective.