CHAPTER V

SUMMARY AND CONCLUSIONS
5.1. Summary of the Study:

In this study the problem faced by the students of Class I in learning arithmetic had been raised. These students were required to be acquainted with a new and different approach to the study of quantitative relationships characterised by a new symbolism and new concepts. It was felt that in the absence of appropriate teaching-learning opportunities for the fundamental operations the students would develop learning disabilities gradually and cumulatively.

This study had two parts (i) diagnosis of the patterns of disabilities of the students in the fundamental operations in arithmetic, and (ii) prevention of those disabilities through audio-visual methods and techniques. It was hypothesized that if the students were taught through audio-visual aids and techniques, they would not develop disabilities, and would show better achievements, better retention and better interest in learning than those taught by the conventional method.

Only two basic operations in arithmetic - 'addition' and 'subtraction' were selected for the study. For the identification of disabilities in these areas two diagnostic tools were devised. The content-areas were selected from the newly approved syllabus of arithmetic for Class I by the Director of Public Instruction, West Bengal. These content-areas were analysed in terms of major objectives and specific objectives. All types of possible operations were
taken into consideration while developing the tools. The tools were subjected to a try-out for the purpose of finalisation.

The diagnostic tools in 'addition' consisted of nine major objectives, thirty-four specific objectives and one hundred test items. The diagnostic tools in 'subtraction' consisted of four major objectives, sixteen specific objectives, and one hundred test items.

The sample consisted of students of Class II of six primary schools situated in different areas. Out of these six schools four were co-educational schools. The brightest students of these schools were kept outside the survey. The total number of students surveyed was two hundred both in case of 'addition' and 'subtraction'.

Types of errors were analysed from the written responses obtained from the administration of the tools. Frequency of incorrect answers including no answer for each individual as well as number of students failing to respond correctly to each item of the tools was recorded.

Two weeks after the administration of the two diagnostic tools, they were readministered on twenty percent of the sample for finding out the reliability of the tools. The product-moment coefficient of correlation between Test and Retest results in 'addition' was found to be .98, and that in 'subtraction'. These coefficients were significant at the .01 level.
A structured interview was conducted with these twenty percent students in order to supplement the knowledge regarding the nature of disabilities already shown by the students in the tools, to locate the causes of their deficiencies in the operations, to test the validity of the previous responses made by the students, and to formulate fruitful procedures for preventive measures.

In case of 'addition' the coefficient of correlation between the extent of disabilities against the main operations of the tools as detected by the diagnostic tools and these by individual interviews was found to be .99 and that in 'subtraction' .99. These coefficients were significant at the .01 level.

Twenty patterns of disabilities in 'addition' and sixteen in 'subtraction' were finally identified (Tables 11 and 12 pp. 113–115).

For the experimental study for taking preventive measures four schools (Appendix 16, pxxix) located in disadvantaged areas - one from semi-urban areas, two from rural area, and the rest from urban area were selected. A larger number of schools of more varied types could be taken for increasing the degree of generality and precision. In this part of the study it was designed to keep the 'Teacher' variable constant for all the schools. Moreover 'time' was considered to be another factor. It was necessary to complete
the experimental work at the same time in all the schools in the beginning of session of the schools, as these basic concepts on 'addition' and 'subtraction' were taught in the beginning of the school session.

Teaching-learning situations were provided under controlled and experimental situations for Class I students for the first six weeks of the beginning school session. The same content (Appendices Nos. 14 and 15, pp. xxvii; xxviii) was treated in both the groups.

Nine class-periods were employed for the teaching of the whole content areas under study - five for 'addition' and four for 'subtraction'.

For the experimental group (Group - A) nine Teaching Units - five in 'addition' and four in 'subtraction' (Appendices Nos. 19 to 27, pp. ix-l to Lxxxi) were developed on these content areas.

An intelligence Test (Appendix No. 17 p. xxxiii) was administered on both the groups, and the relevant scores were considered as pre-test measures for the analysis of covariance. The previously designed diagnostic tools (Appendices Nos. 3 and 4, pp. iv; xi) were employed as post-tests.

The Hypothesis $H_1$ (p. 17) was then subjected to statistical tests. To test the significance of the adjusted Methods differences, the value of 'F' was found
out dividing the reduced variance for Methods by the adjusted M X S variance. The value of 'F' in this study was 34.53 and significant at the .05 level. Moreover, the Hypotheses H₂ and H₃ (p.17...) were retained by circumstantial evidences. Thus all the three hypotheses were tested and retained.

5.2. Conclusions:

The major patterns of disabilities of the students in the processes of 'addition' and 'subtraction' in arithmetic were diagnosed and preventive measures to reduce these disabilities were adopted. Experimentation on controlled and experimental groups was employed, and through the analysis of covariance the following conclusions were drawn:

1. A marked difference in the effect of the treatments with which the controlled group and the experimental group in each of the four schools was noticed.

The means of criterion scores of four schools treated by the conventional method were found to be 123.33, 91.00, 99.60 and 102.67, and by the audio-visual methods and techniques 170.07, 129.40, 177.13 and 178.33 respectively. The differences between these two methods were found significant from the analysis of data (p.127). The ratio between the method variance and the error variance was significant at the .05 level.
Hence the first hypothesis ($H_1$) was retained. It meant that the experimental groups taught by audio-visual materials and techniques had learnt significantly more than the controlled groups taught by the conventional method.

2. The study had shown that there occurred interaction effect ($M_x S$). The 'F' ratio (25.41) between the reduced $M_x S$ variance and the adjusted within classes variance was found to be significant at the .01 level. This interaction effect could not be avoided even though the experimenter adopted his most sincere attempts to control the variables.

3. The $M_x S$ variance was used by the investigator as the error variance. Hence to test the significance of the adjusted methods differences this error variance was utilised.

4. The investigator evaluated daily the achievement of the students in both the groups after the expiry of teaching. Everyday during experimentation the students showed very satisfactory results. The comparison between the two groups in each schools was made daily and no significant difference was found between the groups. But when the experiment was over the two groups were examined with the help of the post-tests. The picture was quite different. The controlled groups taught by the conventional method learnt mechanically.
the processes of 'addition' and 'subtraction' in arithmetic, and hence by lapse of time, they (the students of the controlled group) forgot the processes. The students of the experimental groups showed better achievements when evaluation was made after the expiry of the experiment. This finding revealed that the students who learnt by the audio-visual methods and techniques retained more knowledge and understanding than those who learnt through the conventional method. Thus the second hypothesis (H2) was retained.

5. The experimental groups showed more motivation than the controlled groups while the experimentation was going on. This difference of motivation between the groups was evident from the following circumstantial evidences:

(a) Greater participation of the students in class-teaching: The students, it was evident from registers of attendance kept by the experimenter, of the experimental groups were more regular at their attendance in class-teaching.

(b) More motivation in learning: The eagerness recorded daily by a check-list of the students showed that a happy and friendly relationship was developed between the students and the experimenter. This earnestness was evident more in case of the experimental groups.
(c) Interest shown in outside class activities: The experimenter gave home task after each lesson to both the types of the groups. It was evident that more number of students of the experimental groups brought back home task on the next day of teaching.

The evidences shown above proved conclusively that the experimental groups were motivated in the learning more than the controlled groups. Thus the hypothesis \( H_3 \) was retained.

6. The students under the study were in the age-group 6+ to 7+. This was the period where they began concrete operations. They could form concepts of numbers and classes. The investigator utilised the theory of Piaget in the development of number concepts, and 'addition' and 'subtraction' of numbers. The conceptual skills of the students in manipulating the numbers were found dependent upon the perceptual objects shown to them during experimentation. The experimental group gained more through this processes of exposure of concrete aids in the formation of the concept of number and its manipulative operations.

It was not the aim of the experimenter to show the superiority of one method over the other. The experiment he conducted was a means to an end - the end being the reducing of learning disabilities in the two fundamental processes in arithmetic. It would undoubtedly claim that the specific learning disabilities which would have occurred if proper steps were not taken, were checked, if not totally eliminated. This experiment might be utilised by the practising teachers in the schools teaching the subjects, and would develop insight in preparing Teaching Units suitable for teaching these areas.

5.3. Recommendations:

The experimenter gained certain valuable experiences during the conduct of experiment on the basis of experiences. He suggested the following preventive measures which would help remove the learning disabilities of the students.

1. Improved text books:

More improved type of text books and instructional materials were needed for the development of knowledge, skill, interest, etc. of the child. The text books should be presented in such a way that the child might get more interest in arithmetic. Operational analysis in arithmetic should be the first task of a teacher before teaching the children in the class.
2. Work Education:

Work-education had been introduced in the school curriculum by the State Government. The students would prepare tools, materials, and other apparatuses which would help them in problem-solving. The teacher should guide them in preparation of material-aids which would clarify their fundamental concepts and improve their skills. Clay-work, paper-cutting, plastic work, wooden-blocks etc. should be introduced in arithmetical problem solving.

3. Preparation of Audio-visual-aids:

During the conduct of method experiment by the audio-visual aids in the schools a great zeal and enthusiasm among the students was noticed. The aids would build up fundamental concepts and stronger bases in arithmetic. The traders might prepare small and low-cost arithmetical aids on commercial basis.

4. Individual attention:

From the experiences of the experimenter it was found that individual attention could avoid much of the disabilities of the students. To avoid greater disabilities it was essential to attend the students individually.
5. Sympathetic treatment of the teacher:

The teachers should have sympathy and affection upon the students. The teachers are called man-maker. So they must have a great role to play both in the classroom and in the society. They should inspire and encourage the students. They should listen to the students' difficulties and help them understand the problems. There should be a co-operation between the teacher and the students. Thus the students would develop self-reliance and would be inspired to work more.

6. Selection of best method for teaching:

According to the degree of disabilities in arithmetic the teacher should choose the method in such a way that the students might get maximum benefit of achievement. The teacher should also select the method befitting nature of the content.

7. Training Institute of diagnostic and preventive measures for teachers:

The teachers should have additional training in a particular field so that disabilities could be avoided to some extent. The teachers should be trained in four main lines of activities: (i) training in preparation of diagnostic tools, (ii) training in administering, analysing and interpreting diagnostic tools, (iii) understanding the factors causing disabilities, and (iv) training in the development of Teaching Units. This type of course might be opened by the State
Government in collaboration with the NCERT (New Delhi) and the University Departments of Education.

8. A special coaching system within the school:

Each and every school should have an arrangement for special coaching classes in the different subjects particularly in mathematics with the limited number of students in a group. It would be easy to diagnose the disabilities and take up preventive measures.

5.4. Limitations of the Study:

The present study had two distinctive features—(1) diagnosis of the major patterns of disabilities in 'addition' and 'subtraction' in arithmetic, and (2) executing preventive measures for the students who might develop disabilities in above two areas. The recent psychological and evaluative procedures were followed as far as possible to reach the goal of the journey. But inspite of his sincere and painstaking efforts, the investigator had to move on within certain unavoidable limitations. Some were stated below:

1. Sample for diagnosis:

Six schools - four co-educational, one boys' and one girls' were chosen for the diagnosis of the major patterns of disabilities in the areas chosen. Though, the students
were selected from different strata of the society - rural, semi-urban, and urban, more students could have been employed for the diagnosis of all possible patterns of disabilities.

2. Test Validity:

The diagnostic tools were prepared on the basis of operational analysis of the contents in arithmetic. Thus the tools possessed content validity. Besides these, the tools were validated against the performance of the students at individual structured interviews which served as an external criterion. No other standardized test was available, which could have been used as a better external criterion.

3. Control of independent variables:

The investigator tried his best to control the independent variables identified. But some important variables such as factors related to personality traits, social and environmental conditions, physiological conditions of the students were kept outside control. In the present society it was difficult to involve these extraneous variables which could require more complex experimental control. The generality of the experimental result might have been decreased by doing so.

4. Duration of the experiment:

For five weeks the experiment in the schools was conducted. The investigator took usually six classes per
week for each section in each school. To develop concept in fundamental operations in arithmetic, more time was required. But since the investigator had to work under the prescribed rules and regulations of the schools, he had to teach within such limitations. It could be predicted easily that more intensive as well as extensive teaching would produce better and lasting results.

5. Use of intelligence test as pre-test for the analysis of co-variance:

To increase the precision of the experiment the investigator used an Intelligence Test as pre-test. The test helped in finding out adjusted variances for the methods. To use Intelligence Test as a predictor of achievement had limitations. The psychologist would suggest more accurate predictor than the Intelligence Test. But since arithmetic was introduced at the impart classes, and there was no other standardized test available for employing it as predictor, the investigator had no other alternative but to choose the widely used Intelligence Test by Dr. G. B. Kapat.

6. Selecting improved method of teaching as a preventive measure of learning disabilities:

Learning disabilities might develop in the children for various etiological reasons - neurological dysfunction, psychological abnormalities, socio-cultural deficiencies and
environmental factors. Here the investigator had taken into account one aspect of environmental factors - poor teaching and learning which he wanted to improve for checking, if not fully eliminating the learning disabilities of the students in 'addition' and 'subtraction' in arithmetic. It was felt that with the modern researches for diagnosing and treating the etiological factors, the disciplines of education and psychology should share side by side the solution of problems of learning disabilities of the students. It was also hoped that with this type of inter-disciplinary approach the problems of learning disabilities could be solved.