CHAPTER VIII

SUMMARY & CONCLUSION

SECTION I : SUMMARY

SECTION II : CONCLUSION
The researcher has tried to summarise the thesis in this chapter. For the detailed discussion, it is essential to refer to the main body of the thesis. Major facts are listed point-wise. The points are numbered. The first figure indicates the chapter serial and the following number the major points that has been summarised.

1.1 Expansion of Secondary Education in India has been remarkable. Attention is being paid to the qualitative improvement of secondary education.

1.2 Secondary school mathematics curriculum has been expanding to keep pace with the explosion of knowledge and the international trends. In addition to Arithmetic, Geometry, Algebra and Mensuration, Trigonometry, Statistics, Computer Programming have become integral parts of the secondary school mathematics curriculum.

1.3 Mathematics augments thinking and reasoning powers. George Polya emphasized the need of effective teaching and learning of mathematics.

1.4 Indian researchers like Singh (1978); Kaul, Balachandran (1981); Sohoni (1977); Arora (1976); Mohammad (1982); Gupta (1979) and others have highlighted certain important aspects of mathematics teaching.
1.5 The present study is concerned with the effectiveness of teacher and teaching method in secondary school mathematics and is titled "Effectiveness of Teacher and Teaching Method in Secondary School Mathematics".

1.6 Operational definitions of selected terms like 'Effectiveness', 'Teacher', 'Teaching Method', 'Secondary School' have been provided.

1.7 The need for research into teacher-effectiveness has been propounded by eminent educationists like Ryans, Biddle, Ellena, Gupta, et al. National Policy on Education, 1986, emphasized the development of the competence and effectiveness of teachers. Indian Education Commission (1964-66) had also emphasized the need for research in teacher effectiveness.

1.8 According to Polya and Halloran, Mathematics is a difficult subject. It becomes more so due to non-availability of good mathematics teachers. The need for good mathematics teacher is of utmost importance and identification of the characterisation of an effective mathematics teacher is an urgent imperative.

1.9 Teaching success depends upon the adoption of the right methods of teaching. Subject matter needs to be arranged
and presented sequentially and logically. Mathematics is a much feared subject. Teachers need to adopt the appropriate methods of teaching mathematics to sweeten the bitter-pill.

1.10 The main objectives of the study were:

(i) To elicit students perception relating the effectiveness of the mathematics teachers and the methods employed by them in teaching mathematics.

(ii) To elicit the opinion of the practising mathematics teachers of central schools about the effectiveness (and ineffectiveness) of different strategies currently adopted in teaching mathematics.

(iii) To compare the effectiveness of the Analytic Method vis-a-vis the Synthetic Method.

1.11 The study was confined to the central schools. Most of the teachers belonged to the central schools of Northern Andhra Pradesh and Orissa. Students of three categories like bright, average and below-average were selected for the study. Experimental study was conducted with reference to the Analytic and Synthetic Methods.
1.12 Normative Survey method was followed to collect relevant data. Experiments were conducted to study the comparative effectiveness of Analytic and Synthetic methods of teaching.

1.13 The sample consisted of 105 teachers from 35 schools with varying maturity and sizes. Sample students were taken from Classes VIII, IX and X of central schools. Students of bright, average and below-average standards were taken. Most of the students belonged to the families of good socio-economic status.

1.14 The Student's Questionnaire consisted of fifty two objective questions with multiple choice answers and a few questions that elicited student's opinion.

1.15 The Teacher's Questionnaire had ten sections. First part of the questionnaire consisted of questions with multiple choice responses and the second part tried to elicit the opinions relating to the different teaching skills.

2.1 Secondary Education has a particularly vital role to play in the far reaching social, cultural and economic revolution which is taking place in India.

2.2 The aim of secondary education is to make available to posterity, the wisdom of the past and present so that
the youth may be equipped to solve the problems of the future.

2.3 With the introduction of 10 + 2 + 3 pattern of education, uniformity of structure of secondary education all over the India is evident. Secondary Education consists of Class VIII to Class X.

2.4 The outline of the secondary school curriculum is as follows:

1. Three languages
2. Mathematics
3. Science
4. History, Geography and Civics
5. Art
6. Work experience
7. Physical Education
8. Education in Moral and Spiritual Values

2.5 Central schools were set up with a view to provide educational facilities for the children of transferable Central Government employees, including defence personnel. Central schools provide a common programme of education. These schools are expected to be model schools in the context of the national goals of Indian education, to initiate and promote experimentation in education in
Mathematics is a highly intellectual process involving skills and ideas in solving the problems of mankind. It is a highly conceptualized, logical systematic thought process.

According to Andrew J.C. Begg, the aims of mathematics education are the following:

(i) **Personal** - to help students solve the everyday problems of adult life;

(ii) **Vocational** - to give a foundation upon which a range of specialised skills can be built;

(iii) **Humanistic** - to show mathematics as part of our cultural heritage.

The Cockcroft Report outlined the objectives of mathematics education to include opportunities for:

(i) Exposition by the teacher;

(ii) Discussion between teacher and pupils and between pupils themselves;
(iii) Appropriate practical work;

(iv) Consolidation and practice of fundamental skills and routines;

(v) Problem solving including the application of mathematics to everyday situations;

(vi) Investigational work;

The objectives accepted by the N.C.E.R.T. at the national level for teaching mathematics were: the students should be able to:

(i) Understand and use number system;

(ii) Acquire necessary computational skills, including use of logarithms;

(iii) Understand mathematical concepts in use in trade and commerce and be able to apply them;

(iv) Get acquainted with spatial forms and develop ability to apply the knowledge to measure areas and volumes;

(v) Develop deductive reasoning;
(vi) Understand quantitative data and use elementary statistics to represent them in different forms and be able to interpret the data for better understanding of situations and for application in life.

2.10 Mathematics is highly related to other subjects like Physics, Chemistry, Biology, Social Studies, Languages, Art and Craft. A good foundation in mathematics promotes the proper understanding of all other subjects.

2.11 Every rule and every law of Physics is expressed in the form of a mathematical equation. The units of measurement are employed to substances in Physics as frequently as in Mathematics.

2.12 All chemical combinations and their equations are governed by certain mathematical laws. Formation of chemical compounds is governed by mathematical calculations.

2.13 Mathematical processes and calculations are being increasingly employed in advanced studies relating to heredity, nutrition, growth, maturation, fatigue and many other branches of Biology and Physiology.

2.14 Mathematics is the foundation of engineering and technology.
2.15 Cartography is essentially a mathematical problem. Geography can never be understood without a mathematical perspective.

2.16 The approach of Architecture, Sculpture or Painting can be appreciated through a proper understanding of the mathematical principles behind the designs.

2.17 Mathematical quizzes, competitions, designing with the aid of geometrical patterns provide adequate avenues for recreation and engaging oneself in creative activities.

2.18 Almost all the social sciences are trying to attain exactitude. In the process, all of them are employing sophisticated mathematical formulae and statistical processes to analyse the data and arrive at appropriate conclusions.

2.19 Mathematics is highly essential for enriching and sharpening human thought. Mathematics is steadily and silently shaping culture. Mathematics possesses such characteristics as accuracy, certainty, originality, rationality and veracity etc which greatly assist mankind in its struggle for existence. The application and utilisation of the fundamental processes of mathematics permeate daily life.
Throughout the ages, teachers have occupied honourable positions in the society. In ancient India, teachers were treated as the creator, the caretaker, the destroyer the three Gods of Hindu mythology. The influence of the great teacher extends through many generations. Quality of education depends on the quality of teachers at school level. The strength of an educational system depends upon the quality of its teachers. It is the teachers who are the the acknowledged architects of the destiny of a Nation.

Survey of related literature in India and abroad enriched and enhanced researcher's learning and knowledge with the work done in the concerned field. The studies that were pertinent have been discussed.

Singh studied the relationship of teacher's personality, success in teaching and impact on student's behaviour.

Kaul studied Personality Variables of popular teachers in secondary schools.

Balachandran studied Teaching Effectiveness and Student Evaluation of Teaching.

Mutha studied an Attitudinal and Personality Study of effective teachers.
3.6 Sohoni and others studied the Development of Teachers Effectiveness through Teaching Practice.

3.7 Arora studied differences between effective and ineffective teachers.

3.8 Gupta conducted research on effectiveness of the methods of teaching Geometry in high schools by experimental method.

3.9 Mohammad examined the effectiveness of methods of teaching mathematics in developing mathematical creativity.

3.10 Gupta studied some factors considered to be helpful in class teaching.

3.11 Dubey studied the relationship between Pupil Characteristics and classroom behaviour of teacher.

3.12 Shukla identified major skills involved in Mathematics teaching at secondary school stage.

3.13 Roy studied the traits of teacher associated with classroom interaction patterns.
3.14 Sharma studied the comparative effect of teaching mathematics by the method of Programmed Instruction and Conventional classroom method.

3.15 Allan Podbelsek presented a paper in 5th International Congress on Mathematics Education about Comprehensive School Mathematics Programme.

3.16 John C Egsgard studied about Personality Factor of mathematics teacher.

3.17 Howard Russel studied the results of the Second International Mathematics Study.

3.18 Akira Yamashita studied the value of mathematical education retained by Japanese Society as a whole.

3.19 Afzal Ahmed studied low attainment in mathematics by school children.

3.20 Josette Adda studied Fight Against Academic Failure in mathematics.

3.21 Andrew J C Begg studied the syllabi and teaching methods and suggested alternative programmes.
3.22 Sigmond studied characteristics of the Effective Teacher based on pupil evaluation.

3.23 David G Ryans studied the characteristics of teachers, their description, comparison and appraisal.

3.24 Lamke studied personality and teaching success.

3.25 Jones analysed aspects of teaching ability.

3.26 Barr A S studied characteristic differences in the teaching performance of good and poor teachers of social studies.

3.27 Jenson, Alfred discussed about determining critical requirements.

3.28 Worthen conducted a study of discovery and expository presentations for teaching mathematical concepts.

3.29 Olander and Robertson studied the effectiveness of discovery and expository methods in fourth grade mathematics.

3.30 Loower explored the differential effects of small group heuristics and expository learning in Calculus.

3.31 A list of Committees and Conferences held on Mathematics in various countries has been provided.
4.1 Teacher effectiveness is a major factor of a healthy educational system. It has engaged the attention of many researchers. Studies in the field of teacher effectiveness have a permanent place in the field of education.

4.2 The criteria of judging success in teaching are:

(i) Presage criteria
(ii) Process criteria
(iii) Product criteria

Teacher effectiveness depends upon teacher's age, sex, social status, according to presage criteria.

Teacher's behaviour, interaction with students, classroom teaching, methods of teaching are included in process criteria.

Pupil change, growth, learning or gain are the most important aspects of product criteria.

4.3 In 1981, Gupta and Kapoor designed a profile of effective and ineffective teachers based on a teacher-effectiveness scale.

4.4 The often used term 'Guru' for the Indian teacher signified his weight in the intellectual realm. As a weighty
intellectual, he wielded tremendous influence over his pupils and provided them with the right intellectual orientation.

4.5 A teacher's role is important in taking care of students and moulding their behaviour and nurturing their interest and curiosity.

4.6 A good mathematics teacher enables his students enjoy mathematics through his knowledge, love for the subject and affection and kindness towards his students.

4.7 According to Edith Biggs, the objectives for a beginning mathematics teacher should have the following:

(i) All the students should enjoy mathematics

(ii) The teacher should help in developing student's confidence with their own ability.

4.8 An effective mathematics teacher should have:

(i) Proficiency in fundamental skills

(ii) Comprehension of basic concepts

(iii) Appreciation of significant meanings
(iv) Development of desirable attitudes

(v) Efficiency in making sound applications

(vi) Confidence in making intelligent and independent interpretations

5.1 This chapter deals with the behaviour and personality of the teacher.

5.2 Maximum number of teachers had unclear and inaudible voice in Category-I (highly effective). 10% had unclear voice and 6% did not have audible voice. This indicated students did not consider voice as one of the major criteria for judging teacher-effectiveness.

5.3 According to students' view, the highly effective mathematics teacher had the following traits:

(i) Enthusiastically interested in teaching

(ii) Teacher teaches properly

(iii) Knows the subject very well

(iv) Impartial
(v) Respects students' opinion

(vi) Invites discussion in the class

(vii) Gives students a fair chance to make up work

5.4 Teachers not committing mistakes was maximum in Category-I (i.e. 48%) and minimum in Category-II (i.e. 20%). Teachers admitting mistake was maximum in Category-III (i.e. 10%) and minimum in Category-II. Admitting mistake is a desirable trait of teacher effectiveness.

5.5 Teacher's affection for the students and teacher-effectiveness go side by side. 43% of the teachers from Category-I were highly affectionate towards their students, and 57% evinced adequate affection.

5.6 The determining teacher effectiveness traits as stated by Ryans were well accepted by the sample teachers. The first five ranks were the following:

(i) Self controlled, not easily upset

(ii) Encourages pupils to try to do their best

(iii) Classroom procedure is planned and well organised
(iv) Cheerful, optimistic
(v) Is fair, impartial and objective in treatment of pupils.

5.7 Teacher's knowledge of his students and his effectiveness have high positive correlation. Percentage of teachers knowing their students was maximum in Category-I. 42% of the teachers knew their students very well. 52% knew well and 6% had superficial acquaintance.

5.8 Some of the traits which were conspicuous among ineffective teachers, stated by the students, were:

(i) When asked to clarify doubts, the teacher immediately referred to some old topic when the student was not very sure about it.

(ii) Teachers got irritated and angry

(iii) Teacher was incapable of clarifying the doubts

(iv) Did not bother to respect student's views

6.1 This chapter deals with various aspects of teaching mathematics. They were:
(i) Preparation for teaching
(ii) Inculcating love for mathematics
(iii) Maintaining discipline
(iv) Memory work
(v) Written work
(vi) Reinforcement strategies
(vii) Evaluation

6.2 The coefficient of correlation between knowledge and effectiveness was found out to be 0.999. Knowledge and effectiveness of teacher are highly correlated.

6.3 72% of the teachers followed other reference books in teaching in Category-I. The percentage of teachers following other reference books decreases with the rate of effectiveness.

From sample teachers, 98 teachers out of 105 consulted reference books. 80 teachers out of 105 read mathematical journals.

Following reference books other than text book is a positive index of teacher effectiveness.

6.4 90% of the teachers from Category-I completed the syllabus on time. Rate of completion decreases with the rate of effectiveness.
According to 57 teachers out of 105, the factor most adversely affecting their teaching was over work. Over crowded syllabus affected the teaching of 40 teachers out of 105.

Over work and over crowded syllabus are the factors affecting teacher effectiveness.

90 teachers out of 105 emphasized the problems which were most likely to occur in the examination. Taking cognisance of the present needs, teachers adopted examination oriented teaching. This was viewed as a desirable trait of teacher effectiveness by the students. This was a pragmatic view of the students and may not stand up to the scrutiny of theoretical imperatives.

90 teachers out of 105 paid individual attention to most of the students of the class. Paying individual attention is related to teacher effectiveness.

55% of the teachers did not follow different methods of teaching in Category-I in a class of mixed-ability group whereas it was 47% and 44% in Categories II and III respectively. Teaching through different methods in a class of mixed-ability group is not essential for effective teaching.
6.9 84% and 33% from Categories-I, II and III respectively provided proper explanation in teaching. Teacher's explaining ability and his effectiveness were highly correlated.

6.10 94% in Category-I allowed discussion in the class. 28% in Category-I allowed discussed among the students only. 60% in Category-I allowed discussion among the students and the teachers. Allowing discussion in the class is highly correlated with teacher effectiveness. Allowing discussion among the students only is also desirable for effective teaching.

6.11 Percentage of teachers using teaching aids decreases gradually with the rate of effectiveness. 58% in Category-I used Geometrical instrument box in teaching. Use of other teaching aids like Graph Board, Chart, Model, Video Cassette slide, film strip is not very prominent. Use of teaching aids in teaching is an index of teacher effectiveness.

6.12 71%, 35%, 27% in Categories I, II and III respectively assisted their students greatly in learning. Teachers encouragement is highly correlated with teacher effectiveness.

6.13 Percentage of teachers clarifying doubts goes on decreasing with the rate of effectiveness. 94%, 90% and 73%
in Categories I, II and III clarified the doubts of the students.

6.14 As viewed by the teachers, the following should be the attitude of effective teachers:

(i) The teacher should have love for his subject

(ii) The teacher should have mastery over the subject

(iii) The teacher should be conversant with the techniques of class control.

The above three statements got 1st, 2nd and 3rd ranks respectively.

The statements which got least score were:

(i) Teacher's qualification should be as high as possible.

(ii) Teacher's qualification does not determine effectiveness.

6.15 410 students liked mathematics. 335 liked because their teacher taught them properly. 75 liked it for some other reason. 40 students did not like mathematics. Out of
these 40 students, 15 did not like because their teacher did not teach properly. Students liking the subject and teachers' teaching process are highly correlated.

6.16 Strategies adopted for inculcating interest in mathematics as perceived by the teachers were:

(i) The teacher should see that there is genuine learning and not mere memorization by rote,

(ii) Teachers approach needs to be sympathetic and encouraging.

(iii) School reports on the pupils progress should be constructive and sympathetic.

6.17 100% teachers in Category-I tried to arouse interest. The percentage decreases gradually with the effectiveness of teachers. Teachers' role in arousing interest in the subject was considered important for effectiveness of teacher.

6.18 94%, 90% and 50% of the teachers in Categories I, II and III respectively assisted the students in developing thinking and reasoning powers.
100%, 87% and 75% of the teachers in Categories I, II and III respectively used examples in teaching. Using examples in mathematics teaching promotes effectiveness.

"Mental work should be of such type where accuracy is not disrupted". This view elicited considerable support from the sample teachers. Mental work should be encouraged to shorten written work did not find strong support from the teachers.

The number of teachers providing individual guidance goes on decreasing as effectiveness goes on decreasing.

Teachers of all categories conducted various co-curricular activities; but the rate decreases as the rate of effectiveness decreases.

Teacher's role in maintaining discipline as perceived by the teachers were the following, (in order of rank):

(i) Tactful dealings with the students like; requests rather than commands, cooperative discussions, courtesy rather than curtness.

(ii) Expecting good behaviour from the students
(iii) Class should begin on time and close on time

6.24 The most accepted disciplinary device was "kindness and sympathy". Devices which were not supported by the teachers were:

(i) Handled by the Board
(ii) Same treatment as the offence to the offender
(iii) Loss of privilege
(iv) Lecture
(v) Failure in work
(vi) Suspension
(vii) Reprimand
(viii) Expulsion
(ix) Corporal punishment
(x) Sarcasm
(xi) Ignoring
(xii) Nothing
(xiii) Ridicule
(xiv) Teacher's resignation

6.25 Maintenance of discipline in a classroom is highly correlated with teacher effectiveness. 94% of the teachers in Category-I maintained discipline in the class.
90%, 75% and 60% of the teachers from Categories I, II and III respectively insisted on memorizing mathematical facts and formulae. Students considered, insistence on memorization as a good teaching strategy.

64% of the teachers in Category I adopted application of mathematical formulae as a teaching strategy. 13% took recourse to sufficient drilling. In case of Categories II and III, more teachers relied on drilling technique than on application.

Regarding teacher's role in memory work, teachers perceptions were:

(i) Students memory of earlier work should be strengthened by reviewing it periodically.

(ii) Students should not be encouraged to memorize formulae without understanding.

(iii) Students should be encouraged to memorize all concepts, rules or formulae in mathematics.

94%, 81% and 50% of the teachers from Categories I, II and III had good and clear handwriting. For effectiveness in mathematics teaching, good and clear handwriting is essential.
6.30 95%, 68% and 60% of the teachers from Categories I, II and III put emphasis on neatness and methodical arrangement of written work. Neatness and methodical arrangement of written work is highly correlated with teacher effectiveness.

6.31 Teacher's drawing ability is highly correlated with teacher effectiveness. 84%, 69% and 40% of the teachers from Categories I, II and III had good drawing ability.

6.32 Out of 105 teachers, 95 teachers taught the skill of drawing geometrical figures, 10 teachers did not teach this skill.

6.33 As viewed by the teachers, accuracy of the written work was the most essential aspect of mathematics teaching. The next important factor in written work was neatness and methodical arrangement.

6.34 65%, 55% and 50% teachers in Categories I, II and III respectively corrected written work properly. They laid stress on accuracy of mathematical calculations.

6.35 Working out all the sums given in the text book is not required for teaching effectiveness. 97%, 87% and 75% teachers from Categories I, II and III respectively worked out few model sums in the class. The remaining teachers worked out all the sums in the class.
83%, 72% and 50% teachers from Categories I, II and III respectively provided a chance to the students to work out sums on the blackboard. As perceived by the students, this was an effective trait of the teacher.

Some of the motivational techniques strongly advocated by the teachers were:

(i) Encourage wider student participation

(ii) Establish an environment that is attractive and comfortable.

(iii) Set up learning situations where students may experience some degree of success.

(iv) Relate school work to the world in which they live.

(v) Keep students informed of their success

22% of the students taught by teachers of Category-I viewed their achievement in mathematics very fast. In case of Category-II, it was 5% and nil in Category-III.

Acceleration in the achievement of mathematics is prominent in case of the students taught by effective teachers.
6.39 Home work assigned by effective teachers were enjoyable and useful. 26% of the teachers in Category-I assigned enjoyable homework and 67% assigned useful homework.

6.40 As perceived by the teachers, the most accepted types of homework were:

(i) Homework should be of such type that the pupils are able to do most of the work confidently.

(ii) While assigning homework, the individual differences of the pupils should be borne in mind.

The opinion with which teachers did not agree mostly was "Parents should be discouraged from unduly assisting the children".

6.41 100% teachers from all Categories assigned homework. 94%, 90% and 84% teachers from Categories I, II and III corrected homework. Teachers correcting homework is related with teacher effectiveness.

6.42 42% of the teachers corrected homework in such a way that it was highly helpful in exploring weak points. 94% of the teachers in Category-I did correction work in such a way that students could recognise their mistakes. In
Category-II, it was 95%. Exploring weak points in correction work is related to teacher effectiveness.

6.43 As perceived by the teachers, the teacher should move round among the class during the progress of written work. Teacher should pay particular attention to the known untidy pupils. "Encouraging low achievers by awarding some mark for attempting" got the least support by the teachers.

6.44 Some of the important reasons behind irregular correction of homework as viewed by the sample teachers were:

(i) Lack of time
(ii) Lengthy syllabus
(iii) Other school engagements
(iv) Large size of the class

82 out of 105 teachers admitted they did not correct regularly. Only 23 teachers corrected regularly.

6.45 83% of teachers in Category-I did revision work. In Categories II and III, it was 81% and 20% respectively. As viewed by the students, teachers revision work had considerable effect on teacher effectiveness.

6.46 Questioning as a technique was accorded importance by teachers from all categories. The percentage of teachers
asking questions was 96%, 84% and 80% in Categories I, II and III respectively.

6.47 43%, 39% and 23% teachers from Categories I, II and III asked questions to test students knowledge. Percentage of teachers asking questions to clarify doubts was the maximum in Category-I (28%).

6.48 Some accepted techniques of class questioning by the teachers were:

(i) Questions should be clear and sharp

(ii) Questions should not suggest the answer

(iii) Questions should be organised around major ideas

(iv) Questions should be evenly distributed in a class

Techniques not accepted by the teachers were:

(i) Questions should not be repeated

(ii) Answers should not be repeated

6.49 Teachers viewed that teacher reaction towards students response should always be positive. The opinion that,
"students should not be assisted in responding" was not accepted by most of the teachers.

6.50 Out of 105 teachers, 74 teachers expressed that the purpose of examination is to award promotion and judge the efficiency of teachers. Only 8 teachers used examination result for improving the syllabus.

6.51 Poor results in mathematics in C.B.S.E. were not due to ineffective teaching only. The reasons were many. The nature of the subject mathematics, cumulative underachievement from lower classes, fear towards the subject, neglect by the students contributed to the poor performance.

6.52 50% teachers from Categories I and II did strict evaluation. Only 10% did liberal evaluation. Students perceived strict evaluation is an effective teaching trait.

6.53 Questioning in testing students knowledge was highly effective. Students contributed their ideas freely.

7.1 This chapter deals with methods commonly used in teaching mathematics and comparative study of analytic and synthetic methods of teaching.

7.2 'Method of teaching' refers to a set of actions that are carried out to impart learning in the most effective manner.
7.3 Analytic Method attempts to discover the solution of a problem through analysis.

7.4 The Synthetic Method starts with something already known and connects it with the unknown to arrive at the solution.

7.5 Induction is the method by which general laws are derived from particular examples.

7.6 Deduction is the logical process of deducing a law from known principles and facts.

7.7 Lecture method is the exposition of facts. The teacher, who has prepared well and who has powers of lucid exposition, succeeds in this method.

7.8 Problem solving method is a research like method. It involves scientific thinking as a process of learning.

7.9 Only 15 teachers out of 105 adopted prescribed methods to teach mathematics always. 90 teachers adopted methods to teach mathematics some times.

7.10 Reasons for not adopting suitable methods of teaching always were:
(i) lack of time (as perceived by 70 teachers)

(ii) unsuitable topic (as perceived by 8 teachers)

(iii) constraints of examination (as perceived by 10 teachers)

(iv) lack of ancillary facilities (as perceived by 11 teachers)

(x) lack of student participation (as perceived by 6 teachers)

7.11 Analytic Method of teaching was found mostly applicable in all the topics taught in Class IX. Next to Analytic Method comes the Deductive Method. Inductive Method and Synthetic Methods were found applicable to considerable extent. Problem Solving Method and Teachers Own Method were less applicable in teaching. The least used method is the Lecture Method.

7.12 92 teachers out of 105 understood Inductive Method of teaching. 13 teachers did not understand this method of teaching. 87 teachers used this method to teach Algebra, 36 teachers used this method to teach Geometry, 38 teachers used to teach Modern Algebra, 28 teachers used to
teach Arithmetic, 27 teachers used to teach commercial mathematics and 26 teachers used to teach statistics. This method is widely applicable in teaching Algebra.

7.13 Uses and advantages of Inductive Method of Teaching as perceived by the teachers are:

(i) It involves better student participation

(ii) It is useful in arriving at the formula

(iii) It increases the retentive power

(iv) It dispels fear complex

(v) It requires less drilling

(vi) In small classes, this is an easy and appropriate method of teaching

7.14 Drawbacks of Inductive method of Teaching as perceived by the teachers were:

(i) Ample opportunity is not provided to develop thinking power.
(ii) It is a time consuming method

(iii) It is not applicable for all topics

(iv) Inductive reasoning is not absolutely conclusive

7.15 Out of 80 responding teachers, 8 teachers used this method always; but 72 teachers used it sometimes. This method can be used depending upon the availability of the topic.

7.16 Out of 94 responding teachers, 86 teachers understood the use and utility of the Deductive Method of teaching, 8 teachers did not. 11 teachers did not respond. There were some teachers who did not possess knowledge about this method.

7.17 Out of 84 responding teachers, 70 teachers adopted Deductive Method of teaching, 14 teachers did not adopt this method of teaching.

7.18 Deductive Method was used in teaching Algebra and Statistics by 54 teachers out of 105. 52 teachers used this method in teaching Arithmetic. 50 teachers used this method in teaching Statistics. 42 teachers used this method in teaching Modern Algebra and 38 teachers used in teaching Geometry. Deductive method can be used in teaching all the branches in mathematics.
7.19 Deductive method of teaching is used mostly in Class IX. 62 teachers used this method in Class X. It is also used in Class-X, VIII and VII.

7.20 Advantages of Deductive Method of teaching as mentioned by the sample teachers were:

(i) Easy method to teach

(ii) Suitable for brilliant students

(iii) It is short and direct

(iv) It is a time-saving method

(v) Conclusion brings satisfaction and understanding

7.21 The draw-backs of the Deductive Method of teaching were:

(i) It creates boredom and forgetfulness

(ii) It tends to destroy originality

(iii) Learner becomes inactive and passive

(iv) Demands too much of memorization
(v) Not suitable for the lower classes

7.22 Out of 94 responding teachers, 88 teachers understood this method. 6 teachers did not understand this method. 11 teachers did not understand.

7.23 Teachers perception about Analytic Method of teaching was:

(i) It is good provided questions framed by the teacher are properly designed and graduated.

(ii) It is one of the good methods for teaching mathematics.

(iii) It promotes original thinking and reasoning.

(iv) It is helpful in explaining

(v) It is difficult to apply for teaching all the topics

Advantages of Analytic Method of teaching are more in comparison to other methods of teaching.

7.24 40 teachers used this method most of the time; 44 teachers used it sometimes; 14 teachers used it occasionally; and 7 teachers never used this method.
7.25 40 teachers used this method in teaching Geometry. 10 teachers used it in teaching Algebra; 10 teachers used it in teaching Arithmetic; 4 teachers used this method in teaching all branches of mathematics. Analytic Method is mostly used in teaching Geometry.

7.26 52 teachers out of 105 used this method of teaching Class-IX. It is also useful in Class-X. It is comparatively less useful in the lower classes.

7.27 80 teachers out of 105 had knowledge of Synthetic Method of teaching. 50 teachers viewed Synthetic Method as a time consuming method. 11 teachers did not respond. 28 teachers agreed that topics can be taught through this method. 58 teachers did not agree.

7.28 38 teachers opined that Analytic Method of teaching is the best method of teaching mathematics. Eight teachers viewed Analytic followed by Synthetic to be the best method of teaching. 4 teachers opined no definite method to be the best.

Maximum number of teachers opined Analytic Method to be the best method of teaching. It is highly useful to teach Geometry.
Mean test scores after Analytic Method of teaching were:

\[ M_1 = 13.2 \]
\[ M_2 = 11.936 \]
\[ M_3 = 11.73 \]

Mean test scores after Synthetic Method of teaching were:

\[ M_1 = 5.63 \]
\[ M_2 = 7.93 \]
\[ M_3 = 10.36 \]

In each case, mean test score in Analytic method of teaching is greater than mean test score in Synthetic method of teaching. In analytic method, the test scores decreased gradually \((M_1 > M_2 > M_3)\). On the contrary, synthetic method produced increased test scores \((M_1 < M_2 < M_3)\).

Coefficient of correlation between the scores in each round test is very high. Coefficient of correlation between Analytic Method of teaching and Synthetic Method of teaching are:

\[ \rho_A = 0.958 \]
\[ \rho_S = 0.935 \]
\[ \rho_S = 0.983 \]
On the average, coefficient of correlation between Analytic and Synthetic method of teaching is 0.944. Analytic and synthetic method of teaching are highly correlated.

7.31 Analysis of the test scores showed gradual improved performance in Synthetic method of teaching. Effectiveness of teaching method depends upon the difficulty level of the topic. Topics where difficulty level is low, students proved better in synthetic method of teaching.

8.1 This chapter provides a succinct summary of the entire thesis.